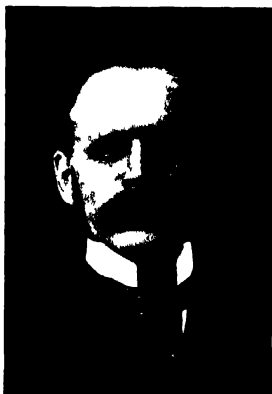


THE NEW
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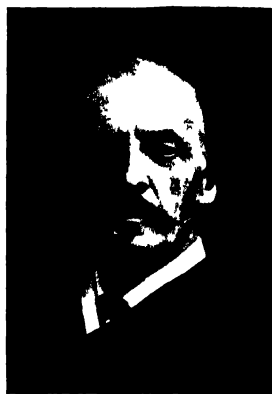
PORTRAITS OF MEN OF THE TIME.—V.



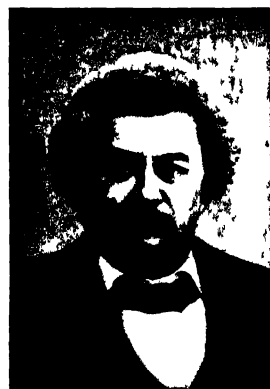
Rev. S. R. Driver



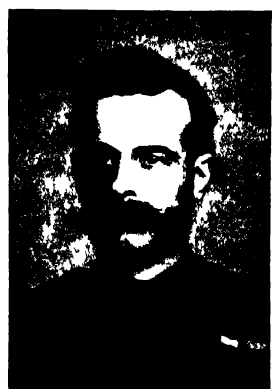
Professor Henry Drummond



M. J. C. Duff



Alex. Dumas pere



Lord Dundonald



George Eliot



Ralph Waldo Emerson



Michael Faraday



Ven. Rev. F. W. Farrer

* The portraits are from photographs by Messrs. Elliott & Fry with the exception of Professor Henry Drummond (T & R Annan & Sons), Lord Dundonald (R. Faulkner & Co.), George Eliot and Michael Faraday (London Stereoscopic Co.).

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Issued under the General Editorship of

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Editor of Oglivie's "Imperial Dictionary"

Assisted by

MANY SPECIALISTS

IN

THE VARIOUS BRANCHES OF HUMAN KNOWLEDGE

Volume V

THE GRESHAM PUBLISHING COMPANY

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1902

LIST OF PLATES AND MAPS.

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SELECT PRONOUNCING LIST

OF ENTRIES IN VOL. V.

KEY: *ā* as in fate or in fare, *a* as in far (sometimes short, sometimes long), *æ* as in fat, *ə* as in fall; *ē* as in me, *e* as in met, *é* as in her, *i* as in pine, *i* as in pin; *ō* as in note, *o* as in not, *ō* as in move; *ū* as in tube, *u* as in tub, *y* as in bull, *ü*, the French *u* (sometimes short, sometimes long); *ou* as in pound, *oh* as in chain; *Ä* as in Scotch loch, German nach; *h* as in French ton; *th* as in thin; *th* as in this; *w* and *y* always consonants, *sh* as *x* in azure or *j* in French jaune.

Drave, draü, dra've, drou
Dreissena, dris e-na
Dreilacourt, dré-lah kör
Drenthe, dren'te
Dreux, dré (long)
Dreyfus, dré'fus
Drogheda, droh'e-da
Drohobyoz, dro'ho-bich
Droit d'Aubaine, drwa dö-bän
Droitwich, droit'ich
Dromore, dro-mör
Drontheim, dron'thim
Drouais, di-ä
Droz, drö
Dschakowa, ja-kö'vä
Dubnitsa, dyb nit'sä
Dubois, dü-bvä
Du Bois-Reymond, du bwa-rä-möht
Dubuque, dü bük'
Ducange, dü-känzh
Du Challiu, du shä-yü
Duchesse, du-shän
Duchin dü'än
Duchoborzi, düä-o-bor'tsä
Ducis, dü säs
Duclos, dü kiö
Duderslach, dü'dér stät
Dudevant, düd-väh
Dufaure, dü för
Dufrenoy, dü-fré nwä
Dufresne, dü-frän
Dufresny, dü-frä-né
Duguy-Trouin, du ga-trö-än
Du Guésclin, du gä-kläh
Duisburg, dö is-hyrt
Dujardin, du zhar-dah
Dukhn, dü'än
Dukinfield, duk in feld
Dulcamarin, dü-ka-ma'in
Dulce, dü sä
Dulcigno, dü'l chén yö
Dulia, dü-lä
Duluth dü-lyth'
Dulwich, dü'lich
Dumarsais, dü-mär-sä
Dumas, dü mä
Du Maurier, du mö ri-ä
Dumfries, dum-fräs
Dumont, dü-mön
Dumont D Urville, dü-mön dü-väl
Dumouriez, dü-mö-ri-ä
Duna, dü'nä
Dünaburg, dü'nä-bürg
Dünamünde, dü na-mün-de
Dunbar, dün-bär
Duncan, dün'kan
Dunblane, dün-blän
Dundalk, dün-dak'
Dundas, dün-däs
Dundee, dün-dé
Dundonald, dün-fon'ald
Dundedin, dün-ä'din
Dunfermline, dün-ferm'län
Dunannon, dün-gan'on
Dungarpar, dün-gar-pör
Dungueson, dün-ges
Dunfield, dün-keld'
Dunkirk, dün-kirt'
Dunlop, dün-löp'
Dunmow, dün-mö'
Dunsco, dü-äwa
Dunoon, dü-möu'
Duns, düns
Dunsenaze, dün-sin'an

Dunstable, dün'stä-bl
Duodenum, dü-o-dé-num
Dupaneloup, dü-pän-lö
Dupaty, dü-pä-té
Duperré, dü-per-rä
Dupetit-Thouars, dü-pé-té-to ar
Duplex, dü-plä
Dupont, dü-pön
Dupont de Nemours, dü-pön dé né-mör
Düppel, düp'l
Dupuis, dü-pwä
Dupuytren, dü-pü-ti-tän
Dujesne, dü-kän
Durance, dü iähs
Durango, dü-rän'gö
Durante, dü-rän tä
Durazzo, dü rät sö
Durban, dü'r-bän
Durbar, dü'r-bär
Duren, dü'ren
Dürer, dü'rér
D'Urtey, dü'rä
Durga, dü'r'ä
Durham, dü'räm
Durkheim, dürk'him
Durlach, dü iä
Duroc, dü-rök
Durs, dü'rä
Durrenstein, dü'ren-stän
Duuy, dü-ru ä
Dusseldorf, düs'el-dorf
Dutrochet, dü-trö-shä
Duykerbok, dü kër-bok
Dvorsk, düvör-shäk
Dwight, düwit
Dyaus, dyous
Dyce, düs
Dynamite, dü'nä-mit
Dyne, dün
Dysart, dü'särt
Dysentery, dü'en-te-ri
Dysmenorrhoea, dü men o-rä
Dyspepsia, dü-pep'sä
Dyspnoea, dü-pnö'sä
Dziggetai, düzig-ti

E

Eadie, ä'di
Eadmer, e ad'mér
Eagre, ä'gér
Earlestown, äir'toun
Easel, ä'zel
Eastbourne, äst'börn
Eau, ö
Eau Claire, ö klär
Eaux Bonnes, ö bon
Ebbw-Valle, eb'ü-väl
Ebern, ä'bérz
Ebony, eb'o-ni
Ebro, ä'brö; Sp. ä'brö
Ecarré, ä-kär'ä
Ecbatana, ek bat'a-na
Ecco Homo, ek's hö'mö
Ecohyomis, ek-ki-mö'sis
Echolastus, ek-klä-si-as'täs
Echolot, äh's-lot
Eckhard, ech'härd
Echelles, Lés, lä-sä-shäl
Echelon, äh's-lön
Echemia, ek-e-nä'sä
Echeveria, ek-e-vé-ri-ä
Echikina, ä-kid'na

Echimis, e-k'f'mis
Echinits, e-k'f'it
Echinocactus, e-ki' nö-kak-tus
Echinococcus, e-ki' nö-kok-us
Echinodermata, e-ki-nö-dér-mä-tä
Echinus, e-ki'nus
Echo, ek'ö
Echuca, e-chö'ka
Ecija, ä'thé hä
Eckhel, ek'hel
Eckmühl, ek'mül
Eclipse, ek-lips'
Eclouge, ek'lög
Ecole des Beaux Arts, ä köi lä bö-ärs
Ecole Normale Supérieure, ä-köl nor-mäl sü-pä-ri-ér
Ecole Polytechnique, ä-köl pol-i-tek-nik
Ecuador, ek-wa-dör
Eczema, ek ze-mä
Edelweiss, ä'dél-vis
Edentata, ä-den-tä-tä
Edfoo, ed-fü
Edgeworth, ej wérth
Edinburgh, ed'in-bu-ru
Edrial, ed-räs
Eedloo, ä-kiö
Effendi, äf'en-dä
Egede, ä'ge-dä
Eger, ä'ger
Egeria, ä'jéri ä
Egham, eg'am
Egremont, eg're-mont
Ehrenberg, ä'en-berä
Ehrenbreitstein, ä ren-brit-stän
Elbenstock, l'en-stok
Elchhorn, l'hörn
Eichtat, ä'tet
Eider, fädr
Eiffel, äf-el
Eigg, eg
Eikon Basiliké, l'kon ba-sil'iké
Eildon, äi'don
Elleithyie, l-i-lä thiyä
Ellenburg, l'en-byrä
Elmbeck, im'bek
Elmsleden, l'ez-deln
Elrenkon, l'en-ni-kon
Elsenach, l'en-ä
Elsenberg, l'en-berä
Elsenben, l'ä-lä-ben
Elsteddfod, l'esth-vöd
Elasmobranchii, el-as-mö-brang'ki-l
Elater, el-ä-ter
Elbe, Ger pron el'bé
Elberfeld, el'bér-feld
Elbeuf, el-béf
Elcanais, el-äes-ä-lä
Elche, el chä
Elchingen, el-Aing-en
El Dorado, el dö rä'dö
Eleanor, el-l'nor
Elastic, el-ä-ä'fik
Eucampans, el-i-kam-pän-rus
Electrophorus, ä-lek-trofö-rus
Elegit, e-lä'jit
Elmiel, ä'l-e-mi
Elephantia, el-e-fän-ti-ä-sä
Elephantine, el-e-fän-ti-né

Eleuthera, el-ü'the-ra
Elgin, el'gin
Elliot, el'öt
Ellichpur, el-ich-pör
Ellora, el-lö'ra
Elmblä, el mä'nä
Elmley, elm'lä
Elloe, ä-löäh
Ellohim, e-lö'him
Ellopura, el ö-pö'ra
Elmlore, el-si-nör
Elswick, el'äk
Ely, ä'li
Elytra, e-l'ätra
Elre, el'täe
Embrun, äh-bruh
Emet, ä'mä
Emigra, ä-mi-gräs
Emir, em'är
Emmenagogue, em-men-ä-gög
Emmerloch, em-e-rä
Empedocles, em ped'ö-kläs
Emphysema, em-fä'sä-mä
Enara, en-ä-rä
Enares, en-ä-rä
Enceinte, äh-sant'
Enchorial, en-chö'ri al
Encke, en'ke
Enclave, äh-kläv
Encore, äh-kör
Encyclopédie, äh-äik-lö-pä-dä
Endlicher, end'l-äer
Endogenous, em ped'ö-nus
Endorhiza, en-dö-räza
Endosmos, en-dös-mös
Endymion, en-dim'i-on
Enfantin, äh-fän-tän
Enfield, en'fild
Engadine, en'gä-dän
Engel, eng'l
Engelhardt, eng'l-härt
Enghien, äh-gi-än
Enkhuisen, eng'höl-en
Enoch, ä-nök
Enteritis, en-te-r'itis
Entracte, äh-träkt
Entrepôt, äh-tr-pöt
Entre Rios, en-tre r'ös
Entresol, ent'er-söl
Eötvice, ä'väh
Eperia, ep'e-kris
Eperch, ep'ärk
Epalement, e-pä'ment
Epanlette, ep'a-let
Epe, ä-pä
Epeira, e-pä'ra
Eperias, e-pä'ryäh
Epernay, ep-e-nä
Ephemera, äf-e-mer'l-dä
Ephesus, äf-e-sus
Ephori, ef-o-ri
Ephoramus, ep i-här'mus
Ephorus, ep-ki-ä'tus
Epicurus, ep'i-kü'rus
Epigynous, e-pi'j-nus
Epimachus, e-pim-a-kus
Epimetheus, ep-i-men'i-däs
Epimetheus, ep-i-mé'thus
Epinal, ä-pi-näl
Epitax, ä-pi-nä
Epirus, e-pä'rus
Eprouvette, ep-rö-vet'
Equid, äk'wi
Equistern, äk-wi-s'tern
Erard, ä'rärt
Eranistratus, e-rä-sä'trä-tus

SELECT PRONOUNCING LIST--VOL. V.

[illegible]

THE NEW POPULAR ENCYCLOPEDIA

A DICTIONARY OF GENERAL KNOWLEDGE

DRAMA (from the Greek *drama*, an action, a drama; from *draō*, I act), a stage-play, a piece to be represented by performers who assume personalities other than their own, and act and speak as such; or, collectively, a class of writings in which persons are introduced as acting and speaking, and the course of the story and the feelings of the parties are to be gathered from what they say and do. In epic poetry the persons of the poem are also often introduced speaking, but narration and description are the prevailing characteristics of the epic, whilst in the drama everything is represented as taking place before our eyes; except, of course, such events as may be told us by words assigned to some of the characters. The drama, therefore, represents *action* and its motives directly, not in the way of narration or description. By a slight development of meaning we may also call an epic poem or a novel *dramatic* when a quick succession of interesting events is rapidly developed; when, in a word, it is strongly characterized by vividly portrayed action. The drama is commonly divided into two great branches, *tragedy* and *comedy*, the former, roughly speaking, melancholy in character, the latter cheerful.

The origin of the drama must be sought for in that powerful agent in human nature—the love of imitation. The rude war-dance of a savage tribe is a beginning of the drama, because it represents an action for the entertainment of the spectators or performers, and the dance is found among all early religious rites. (See **DANCING**.) So dramatic performances, that is to say, imitative representations of important events in religious history or belief, are found among the rites or religious services of all peoples in their early period. In various countries the Catholics, both Greek and Roman, to this day, at the celebration of important religious festivals, bring forward exhibitions which represent, with more or less elaboration, the chief particulars of that event which is to be commemorated. The elements of the dramatic art are thus found among all nations; and probably every people which has made progress in civilization has, at the same time, developed this art. Dramatic compositions are found in the Old Testament, for example in Job and the Song of Solomon. The Chinese and the Indians have their ancient dramatic pieces; but the European drama, in its earliest form, owed its origin to the Greeks.

At first the drama among the Greeks was by no means so distinctly separated from the epic and lyric poetry as we find it as a later period. Both forms, tragedy and comedy, took their rise in the celebrations of the festivals of the god Dionysus (Bacchus), at which hymns and chants were sung by choruses in honour of the deity; and the chorus continued to be a prominent feature of the old

Greek drama. The Greek comedy commenced about 580–560 B.C. with Susrion, who is said to have travelled from place to place holding up to ridicule, on a small movable stage, the follies and vices of his age. That song was originally the main feature of both tragedy and comedy is attested by the very words *tragōidia* and *kōmōidia*, in which the latter element is the Greek *ōidē*, song; and the name *comedy* is by many derived from *kōmē*, a village, so that its original meaning would be *village-song*, though others derive it from *kōmos*, a revel. By degrees the lyric element in comedy gave way to the dramatic, and the comic drama assumed the form which is familiar to us from the plays of Aristophanes, the great Attic writer of comedy (about 444–380 B.C.). He had predecessors and contemporaries such as Eupolis, Cratinus, and Pherecrates, but there can be little doubt he had no equal, though the fragmentary remains of other writers hardly afford us a means of comparison. Most of his plays belong to what is distinctively known as the *old comedy*, in which personal satire was the chief object, and public characters, as well as private persons, were referred to by name and exhibited on the stage. The old comedy of the Greeks was thoroughly national, with much of a political tendency. At the end of the Peloponnesian war (B.C. 404), Greek comedy received a new character and form. The *middle comedy*, so called, now began. It was now strictly forbidden to bring living persons by name on the stage, and the chorus, till then the chief instrument of vituperation, was abolished; whilst, with the representation of general characters, corresponding masks were introduced, instead of those imitating the countenances of particular individuals. Even Aristophanes was obliged to submit to these regulations in his last plays. To the *new comedy* of the Greeks, which formed the next development, belongs Menander, about 300 B.C., who by the keenness of his wit and the regularity of his pieces began a new period, the Greek comic drama. Of his writings and those of his rival, Philémon, fragments only have come down to us, so that we possess no complete specimen of the new comedy, though the Latin plays of Plautus and Terence help us to an understanding of its character. In it we see an approach to the comedy of the modern type.

Tragedy consisted originally of lyric and epic songs sung in honour of Bacchus, at the festival of the vintage, and the name means literally 'goat-song'. (See **GREEK—Literature**.) The invention of tragedy is generally ascribed to Thespis (about 530 B.C.), who was followed by Phrynichus; but the true creator of Greek tragedy was Æschylus (525–456 B.C.). Thespis had only one actor, who from time to time relieved the chorus by declamation. Æschylus changed this representation into real action by

making use of two, and thus inventing the dialogue. The actors now became the principal object of interest with the spectators; the chorus, on the other hand, became less prominent; its songs were shortened, though they still remained long, and were always written in a tone of the highest lyrical elevation, which sometimes appears even in the dialogue. *Æschylus* aimed more at sublimity than beauty. There are many traces of rudeness in his plays, yet they are wonderfully grand. The action is simple in the extreme. The chorus no longer chants songs which have no connection with the play, but it forms a part of one whole, is the adviser of kings, the confidant of the persons of the action, the comforter of the unhappy, the terror of tyrants. *Æschylus* also introduced masks; and by means of a long gown and the *cothurnus*, or buskin, the lofty stature of the heroes was imitated. The accommodations for the spectators were improved, and machinery and scenery were introduced. The theatres, which had been formerly built of wood, now became large stone erections. They had no roof, and the performance took place during the daytime. *Sophocles* (495-406 B.C.) followed *Æschylus*, and showed himself a master of the tragic art. He first introduced a third actor on the stage. Next came *Euripides*, and these three great poets carried Greek tragedy to its perfection. Many poets followed them, but only the three just named have left works which have come down to us; and long before the beginning of the Christian era, and by the time the Greek peoples had been absorbed in the Roman empire, the drama had greatly declined. The old Attic drama had something of a religious character. It really belonged to the worship of *Dionysus*, was supported by the state, and was attended by the people at large, the entrance-money being provided from public funds. The dramatists produced their plays for public competition, and success was followed by the highest honours. Three tragedies, connected in plot and forming a trilogy, were exhibited on the same occasion; a sort of burlesque piece, in which satyrs figured, concluding the whole.

The Romans, a practical nation, and not possessing that keen sense of beauty which we find in ancient Greece, never accomplished much in dramatic literature. The earliest specimens of the drama in Italy were the *Atellan plays*, so called from *Atella*, a city of the *Oscans*. These were farces or pieces in which broad buffoonery prevailed. The regular drama among the Romans was a mere imitation of that of the Greeks, *Livius Andronicus*, *Ennius*, and *Pacuvius* being the earliest writers of Roman tragedy. *Plautus* and *Terence*, a number of whose plays have come down to us, were imitators of the new Greek comedy. Their plays possess great merit and have been the basis of many modern imitations or adaptations. Of the Roman tragedy, the dramas which go under the name of *Seneca* are the only specimens extant. The Romans as a people were much fonder of such spectacles as gladiatorial contests and the games of the circus than of the drama.

In the beginning of the middle ages such dramatic entertainments as survived were attacked by the clergy as heathenish, immoral, and indecent exhibitions; but the favour which they enjoyed among the people, and the spirit of the times, induced the clergy to encourage theatrical exhibitions of subjects from sacred history, or having at least a religious and moral character. Hence arose the *mysteries*, *moralities*, and *miracle-plays*, which in various countries of Europe, including Germany and England, preceded the rise of the national drama.

Many of these mysteries and moralities that were performed in the English towns have come down to us. Latterly historical characters began to appear in them, and this naturally served to pave the way for the introduction of the regular drama. In Italy the modern drama began earlier than in other countries, plays being first written in Latin in imitation of those of classic times. About the beginning of the sixteenth century the Italian language began to be employed. *Ariosto* and *Machiavelli* wrote dramas; and the *Mandragola* of the latter is an excellent comedy. Comedy was cultivated by many Italians, including numerous ecclesiastics. *Alfieri* is the most important of the dramatic writers of Italy, yet his comedies are to be considered rather as bitter satires. *Goldoni* is considered the best Italian writer of comedy.

The English and Spaniards devoted their attention to the drama almost at the same time; the former reaching their acme in *Shakspeare*, the latter in *Lope de Vega* and *Calderon*. The history of the English theatre and the drama is naturally divided into two parts, the first of which begins with *Elizabeth* and ends with the reign of *Charles I.* The rapid development of the drama during the reign of *Elizabeth* owed nothing to foreign influence. *Lyly*, *Greene*, *Peele*, *Marlowe*, *Shakspeare*, *Ben Jonson*, *Beaumont* and *Fletcher*, *Chapman*, *Webster*, *Middleton*, *Marston*, *Ford*, and *Massinger*, are among the chief names connected with the brilliant period of English drama. The Puritans of the Commonwealth prohibited all kinds of plays, and the theatres were shut up for thirteen years. With *Charles II.* the drama reappeared, and in comedy exhibited a licentiousness hardly equalled by that of any other Christian nation. Among the chief names belonging to this period are *Dryden*, *Otway*, *Wycherley*, *Ethérée*, *Congreve*, *Vanbrugh*, and *Farquhar*. To the eighteenth century belong the names of *Addison*, *Steele*, *Cibber*, *Gay*, *Goldsmith*, *Sheridan*, and others. During the nineteenth century many writers have produced dramas, some of them of a high order of merit. Among these may be noted *Byron*, *Coleridge*, *Shelley*, *Talfourd*, *Milman*, *Sir Henry Taylor*, *Knowles*, *Lord Lytton*, *Browning*, *Swinburne*, and *Tennyson*. Among other nineteenth-century writers for the stage may be mentioned *Douglas Jerrold*, *Tom Taylor*, *Charles Reade*, *Thomas Robertson*, *W. G. Wills*, *Henry Byron*, *Dion Bouicault*, *Robert Buchanan*, *W. S. Gilbert*, *H. A. Jones*, and *A. W. Pinero*.

The French drama was in a miserable state before *Corneille* (1606-84). *Corneille*, *Racine*, *Molière*, *Voltaire*, and in later times *Hugo*, are some of the most distinguished dramatists. The theory of the unities, to which the French have so tenaciously adhered, has caused French tragedy to be considered cold, stiff, and unpoetical by other nations; but French comedy is universally admired. Among modern dramatists may be named *A. de Vigny*, *George Sand*, *A. de Musset*, *Mérimée*, *Ponsard*, *Augier*, *Scribe*, *Dumas the Younger*, and *Sardou*.

The German drama is of later birth than any we have mentioned, and for long the Germans contented themselves with translations and adaptations from the French. *Lessing* was the first who, by word and deed, broke the French sway (1755), and he was succeeded by *Schiller* and *Goethe*, who rank as the greatest of the more modern dramatists. Prominent names in German drama are *Kotzebue*, *Körner*, *Schlegel*, *Tieck*, *Brentano*, *Grillparzer*, *Gutzkow*, *Freitag*, *Laube*, *Von Moser*, &c. The Dutch drama begins with the classical tragedies of *Koster* in the beginning of the seventeenth century, and reached its highest in *Vondel* (1657-1659). *Halberg*, *Hei-*

berg, Oehlenschläger, Ibsen, and Bjørnsen are the chief names connected with the Scandinavian drama.

So much has been written regarding the fundamental differences between tragedy and comedy, and the deep-seated feelings of human nature on which these are based, that we may be excused for here quoting the remarks of Schlegel on the subject in his *Lectures on Dramatic Literature*:—

“Tragedy and comedy bear the same relation to one another as earnestness and mirth. Both these states of mind bear the stamp of our common nature; but earnestness belongs more to the moral, and mirth to the sensual side. The creatures destitute of reason are incapable of either. Earnestness, in the most extensive signification, is the direction of our mental powers to some aim. But as soon as we begin to call ourselves to account for our actions, reason compels us to fix this aim higher and higher, till we come at last to the highest end of our existence; and here the desire for what is infinite, which dwells in our being, is thwarted by the limits of the finite, by which we are fettered. All that we do, all that we effect, is vain and perishable; Death stands everywhere in the back-ground, and every well or ill spent moment brings us in closer contact with him. And even if a man has been so singularly successful as to reach the utmost term of life without misfortune, he must still submit to leave all that is dear to him on earth. There is no bond of love without separation, no enjoyment without grief for its loss. When we contemplate, however, all the relations of our existence; when we reflect on its dependence on an endless chain of causes and effects; when we consider that we are exposed in our weakness to struggle with the immeasurable powers of nature, and with conflicting desires on the shores of an unknown world; that we are subject to all manner of errors and deceptions, every one of which is capable of undoing us: that, in our passions, we carry our own enemy in our bosoms; that every moment demands from us the sacrifice of our dearest inclinations, in the name of the most sacred duties; and that we may, at one blow, be robbed of all that we have acquired by toils and difficulties; that, with every extension of possession, the danger of loss is proportionately increased, and we are the more exposed to the snares of hostile attack,—then every feeling mind must be filled by melancholy, against which there is no other protection than the consciousness of a destiny above this earthly life. This is the tragic tone; and when the mind dwells on the consideration of the possible as an existing reality; when that tone is inspired by the most striking examples of violent resolutions in human destiny, either from dejection of soul, or after powerful but ineffectual struggles,—then tragic poetry has its origin. We thus see that tragic poetry has its foundation in our nature, and, to a certain extent, we have answered the question, why we are fond of mournful representations, and even find something consoling and elevating in them! As earnestness, in the highest degree, is the essence of the tragic tone, the essence of the comic is mirth. The disposition to mirth is a forgetfulness of all gloomy considerations, in the pleasant feeling of present happiness. We are then inclined to view everything in a sportive light, and to admit no impressions calculated to disturb or ruffle us. The imperfections of men, and the incongruities in their conduct and relations, are no longer an object of dislike and compassion, but serve to entertain the mind. The comic poet must, therefore, carefully abstain from whatever is calculated to excite moral disgust with the conduct of men, or sympathy with their situation, because this would bring us back to a tone of earnest feeling. He must paint their irregularities as arising out of

the predominance of the sensual part of their nature, and as constituting a mere ludicrous infirmity, which can be attended with no ruinous consequences. This is uniformly what takes place in what we call *comedy* in which, however, there is still a mixture of seriousness. The oldest comedy of the Greeks was, however, entirely gay, and in that respect formed the most complete contrast with their tragedy. Not only the characters and situations of individuals were worked up into a picture of the true comic; but the state, the constitution, the gods, and nature, were all fantastically painted in the most extravagantly ridiculous and laughable colours.”

We shall now say a few words respecting the so much talked of unities in the drama. In consequence of a passage in the *Poetics* of Aristotle, the French, principally through the influence of Boileau, adopted the theory of the three unities in a drama—those of action, place, and time,—and this theory has recommended itself so strongly to the national taste, that a strict observance of the unities is considered by the French one of the chief merits of a dramatic production. The reader who wishes to form a correct idea of the theory of Aristotle may consult with advantage the work of Schlegel above mentioned. The French have construed it to mean, in substance, as follows:—1st, that the action of the drama must be one; the interest or attention must not be distracted by several plots, but everything must be subservient to the main action; 2dly, all the actions must take place on the same spot, or very nearly so, in order that the illusion may not be disturbed; and 3dly, everything ought to happen on the same day, for the same reason. These three rules are all true to a certain degree. The unity of action is as necessary in a drama as in any production of the fine arts; the whole must be essentially one; but the Germans and British think it absurd to confine unity of action within such narrow limits as the French do. On the contrary, as, in a picture of Raphael, many groups exist, all interesting, yet all contributing to form one great picture, and subservient to the main object of the work; so they think it not only allowable, but an excellence, to introduce a number of actions in a drama, if they are so connected as all to make but one whole. What a variety of character and action is to be found in *Romeo and Juliet*! and yet how closely is everything connected! how directly every scene draws towards the great tragic end! The grandeur of a lofty dome is not diminished by the statues and bass-reliefs which it may contain.

The two other unities—those of place and time—may also be too servilely followed. As for disturbing the illusion, Schiller very truly says, that everything on the stage is different from reality. Who thinks that the light of the lamps is daylight! Who, we ask, ever found such a precise square as the stage in a forest! or who ever saw people in real life turning their faces all to one point, as the actors necessarily do, that their action may be seen. The French consider it a great fault if an actor turns his back towards the audience. Is not this inconsistent! Besides, is not the very theory of unity of time, which requires all the events in a drama to happen on one day, entirely at variance with nature! and which is easier, to consider all the events represented in a drama, all the developments of the actions, as happening in one day, or to transport ourselves, in imagination, from one place to another, and suppose weeks and months to pass between the falling and rising of the curtain! Yet there is no doubt that the performance may make too great claims on our imagination. It is impossible to settle precisely the limits within which the dramatic writer should confine himself. As long as he can avoid offending the

imagination by the abruptness of his transitions, he may be considered as not having overstepped the just bounds. The liberties allowed in the drama, as in all the higher branches of art, must depend very much on the genius of the artist. Since about 1820 a new dramatic school has been formed in France, which, departing from the ancient strictness of what is called the *classique*, approaches more and more to the German and British, or what is called the *romantic drama*. The establishment of this modern school formed part of the general reaction against the excessive adherence to classic models in literature, the leader in the movement being Victor Hugo. For further information regarding the dramatic literature of the various countries, see the different articles throughout this work. See also A. W. Schlegel's *Dramatic Art and Literature* (in Bohn's series); J. P. Collier's *History of English Dramatic Poetry*; Donaldson's *Theatre of the Greeks*; Haigh's *The Attic Theatre*; A. W. Ward's *English Dramatic Literature* (1876; new and revised edition, three vols., 1899), &c.

DRAMATIC COPYRIGHT. It is enacted by 3 and 4 Will. IV. cap. xv. that the author of any dramatic piece not printed by him or his assignee shall have as his property the sole right of representing it, or causing it to be represented, in any place of dramatic entertainment; and the author of any published dramatic piece shall have the same privilege during his life, or his assignee for twenty-eight years from the date of publication. By 5 and 6 Vict. cap. xlv. sec. 20, the provisions of the previous statute are extended to musical compositions; and the term of copyright provided for books is applied to the liberty of performing dramatic and musical compositions. Section 21 grants to the proprietors of dramatic works the power of exacting from every offender a sum not less than forty shillings, or the full amount of the profit arising from the performance, or an equivalent to the loss sustained by the party aggrieved, provided the action is brought within a year.

DRAMMEN, a seaport of Norway, in a valley on both sides of the Drammen, at its mouth in an arm of the Christiania Fjord, 25 miles s.w. Christiania. It has manufactures of leather, cotton, ropes, sail-cloth, earthenware, tobacco, &c.; and is the second port in the kingdom for the export of timber, which is conveyed chiefly to Great Britain, France, and Holland. The harbour is deep enough to allow large vessels to load along the quays. The town has suffered severely from conflagrations. Pop. (1891), 20,441; (1900), 23,093.

DRAPERY. See **COSTUME**.

DRAUGHT, the depth of a body of water necessary to float a ship; hence a ship is said to *draw* so many feet of water, when she sinks so far in the water or is borne up by a column of water of that particular depth.

DRAUGHTS, a game played by two persons on a chequered board like the chess-board marked off into eight rows of eight squares each. The squares are coloured alternately black and white, or any two sufficiently distinctive colours may be used instead, the names black and white being retained. Each player has twelve circular pieces known as *men*, which he places, at the beginning of the game, one on each of the twelve black squares (or the twelve non-black squares according to arrangement) of the first three lines of the board on his side. The men belonging to one player are black; those of the other, white, or some other colour. The board must be so placed that each player has in the corner at his right hand a square of the colour which is not being played on. Black moves first always, but at the end of each game the men are interchanged.

The pieces are moved one square at a time forward diagonally to the right or left until interrupted by one of the opposing pieces, or until they reach the line of squares at the farther end of the board. In the first case, if there is a vacant space immediately behind the opposing piece, it can be captured, which is done by leaping over the undefended piece, placing the other in the vacant square, and removing the captured piece from the board. Any number of men may be captured at one move if the above conditions be satisfied. In the second case, the piece becomes a king, and is 'crowned' by having another placed upon it; it then has the power of moving backward as well as forward. The game is ended when one party succeeds in capturing all the other's 'men', or in so hemming them in that they cannot move, or when one player, recognizing the hopelessness of his position, resigns. A variety of the game known as Polish Draughts is sometimes played. Each player may have either twenty or forty pieces which move as in the ordinary game, but may capture backward. The king may move over any number of unoccupied squares or capture a piece or pieces at some squares' distance. The board in this case is divided into 100 squares, but an ordinary board may be used. Draughts is known to be of very high antiquity, for in Egypt, as appears from the monumental paintings, it was a common amusement 2000 years B.C. Homer describes the suitors of Penelope as whiling away their time with a game resembling draughts. The game made its appearance in Europe only three or four centuries ago.

DRAVE, or **DRAU**, an Austrian river which rises in the Pusterthal, in Tyrol, flows e.s.e. across Carinthia and the south of Styria, and between Hungary on the left and Croatia and Slavonia on the right, and after a course of about 465 miles joins the Danube below Esseg. In the upper part of its course it has a very rapid current, and owing to this and the sudden floods which come down charged with debris it is not easily navigated. Its lower course is between flat banks, which it often overflows, causing great devastation.

DRAWBACK, in commerce, an allowance made to merchants on the re-exportation of goods liable to customs or other duties, which in some cases consists of the whole, in others of a part, of the duties which had been paid upon the importation. The more common arrangement now is to put goods liable to such duties in a warehouse under a bond as security for the payment of the duty provided the goods are finally entered for home consumption, while if re-exported no duty is paid.

DRAWBRIDGE, a bridge with a lifting or sliding floor, such as may be used for crossing the ditches of fortresses or may be constructed to cross navigable waters where the height of the roadway is insufficient to allow vessels to pass underneath. There are various kinds of drawbridges. One is the lifting bridge, which is raised bodily on one end. For fortifications this is the kind commonly employed, the platform forming or strengthening the gate when raised. *Swing* or *turning* bridges often have their platform divided into two separate parts, each moved on pivots on the opposite sides of the channel and meeting in the middle when in use. Another variety of this bridge has its roadway undivided and turning on a pivot working in a large hollow cylinder or pontoon placed in the middle of the stream. *Bascule* bridges turn on a horizontal pivot in the middle, and stand in a vertical position when the passage is open. *Rolling* bridges are those which rest upon rollers and can be propelled horizontally upon them so as to close or open the water-way or passage. See **BRIDGE**.

DRAWING is the art of representing upon a flat surface the forms of objects, and their positions and relations to each other. The idea of nearness or distance is given by the aid of perspective and foreshortening. Two ancient Greeks, Ardices and Telephanes, are said to have been the first who attempted to give the idea of roundness by a combination of lines called *hatching*. Philocheus and Cleantes were the inventors of monochrome, or drawings in one colour, in which the lighter parts were produced by mixing the colour with white. This formed the transition from drawing to painting. The Greeks were very strict and precise in their teaching of drawing. Pamphilus, the teacher of Apelles desired that his pupils should remain ten years with him receiving instruction. Linear drawing was brought in Greece to the highest degree of perfection. The contest between Apelles and Protogenes as to which of them could draw lines with the greatest delicacy and precision is well known.

The term drawing, in its strict sense, is only applicable to the representing of the forms of objects in outline, with the shading necessary to develop roundness or *modelling*. Pictures in oil or water colours, though based on drawing, should be exclusively called paintings. This distinction is observed in what follows.

The various styles of drawing may be divided into three kinds: (1) *pen drawings*; (2) *chalk drawings*, which may include lead-pencil drawing; (3) *drawings shaded with the brush or hair-pencil*. *Pen drawings* are often confined to pure outlines; an appearance of relief or projection being given by thickening the lines on the shadow side. *Finished pen drawings* have all the shading produced by a combination of lines termed *hatching*. Small, fine-pointed brushes are now often used instead of the pen, more delicacy and variety of tone being obtained. *Drawings shaded with the brush* are outlined with the pen, the shading being laid on or *washed in* with the brush in tints of Indian ink, sepia, or bistre. This method is used chiefly for architectural drawings and historical sketches. *Chalk drawings* are most suited for beginners, as the errors can be easily corrected. Black, red, and white chalks are used. When the chalk is powdered and rubbed in with a stump, large masses and broad effects can be produced with much rapidity. A combination of hatching and stumping is generally preferable to adhering exclusively to either mode. There are also chalk or crayon drawings in which the leading colours of the objects represented are given lightly with different coloured crayons. This style is well suited for portraiture. Good examples of sketches and studies by the best masters are now easily accessible through the photographic processes.

Drawings may be divided into five classes: sketches, finished drawings, studies, academic drawings, and cartoons. *First sketches* are the ideas put upon paper by an artist, with the intention of carrying them out with more completeness and detail in some more elaborate work. They are merely intended to fix and retain his first thoughts. *Finished drawings* are such as are carefully executed and made complete in all their parts. By *studies* are generally understood separate parts of objects carefully drawn either from life or from figures in relief; for example, heads, hands, feet, arms; but sometimes the term is applied to drawings of entire figures. To this class also belong drawings of the skeleton and muscles, as well as of draperies, animals, trees, foregrounds or other parts of landscapes. *Academic drawings* are those made in art academies from a living model in lamplight, which brings out the shadows more than daylight. The position of the person who serves as a model is carefully arranged at the com-

mencement of each sitting, and in that position he is required to maintain himself. In this way the learners practise themselves in the drawing of the figure in various attitudes. In studying drapery and dress, a *lay figure*, made of wood and with movable joints, is clothed in various styles, and drawings made from it. *Cartoons* are drawings made on stout paper of the size of the paintings to be executed from them. They are mostly employed for pictures of large size, and are regularly used by fresco painters. The design is pricked through or traced from the cartoon upon the surface that is to receive the finished picture. See **CARTOON**.

The first sketches of the great masters are especially prized, because in them we find expressed most clearly the first glow of their conceptions. It is therefore much more difficult to make a copy of a first sketch with such accuracy as to deceive, than it is to make such a copy of a finished picture, for in the former case so much depends upon the freedom and facility with which the idea is expressed. The great schools of painting differ from one another as much in their drawing as in their painting. In Italy the Roman school, through Raphael's fine sense for the beautiful and expressive in form, and through his study of the antique, became the true teacher of beautiful drawing. The Florentine school tried to surpass the Roman precisely in this particular, but it lost by exaggeration what it had gained by learning and a close study of anatomy. In the Lombard school a tender style of drawing is seen through harmonious colouring, but this is rather derived from nature and instinctive feeling than attained by a close obedience to scientific principles. In the Venetian school the drawing is often veiled in the richness of the colouring, and if in some of the Venetian masters the drawing is bold and powerful, it indicates no deeper sense, no elevation or dignity, and is only imposing by its fearlessness and luxuriant fulness. The Dutch school excels in a careful and minute style of naturalistic drawing, combined with great excellence in colouring. The French school in the time of Poussin was very correct in its drawing; at a later period its style betrayed a great amount of mannerism. David introduced again a purer taste in drawing and a close study of the antique, and these are qualities which distinguish his school (the so-called classical school) from the romantic school of a later period, and the eclectic school of the present day, whose drawing is characterized by less dignity and grace, but shows more individuality and character. The modern German masters have a different style, which has been formed by an independent study of nature, and of the great masters, modified by the idiosyncrasies of the German mind. The drawing of the British school is naturalistic rather than academic. It has of late years much improved in accuracy and expressiveness.

The best mode of acquiring the art of drawing is to commence by the simplest geometrical lines, proceeding to geometrical figures, from the more simple to the more complex. The student should first practise drawing accurately—perpendicular, horizontal, oblique, curved, and waved lines; then he should draw squares, triangles, circles, and ovals. These forms are the best for early instruction, because from their simplicity any inaccuracy in their delineation is easily detected. When the learner has conquered the difficulty of drawing these forms with accuracy he should proceed to draw those of a more arbitrary kind, such as the scroll and cylinder; then pyramids, obelisks, or vases, cups, books, baskets, &c., by which he will gradually become possessed of a more correct vision, and be able to give a proper degree of grace to his curved lines.

Having acquired a sufficient facility in drawing and shading these simple forms, he ought next to proceed to drawing from copies outlines of antique busts and statues. Such subjects are well calculated to give correctness to the eye, as from their beauty and perfection any slight deviation from their just proportions instantly offends and is easily detected. On the other hand, when landscapes and flowers are used as copies, an error in drawing the irregular forms that occur in them is much less easily perceived, the student is apt to be too easily satisfied with his work, and to fall into negligent habits which cannot afterwards be easily eradicated. All these drawings should be made on a large scale, and be executed in a bold, distinct, and what painters call a *broad* style. Thus all the separate features of the face should be drawn the full size of life; for next to drawing from bad examples, nothing is a greater hindrance to proficiency than the making of small and miniature drawings.

In beginning a drawing, first get the object or objects into proper position on the paper, next into proper size, and last into proper shape. By inverting this mode of procedure learners frequently render their work very irksome, and are mortified to find that when they have matured a portion of their drawing, the part is not truly in position, or not of the proper size. When the pupil has made a few copies of drawings of busts, statues, &c., he should next commence drawing from a model. Under this term is comprehended any object presented for imitation, whether a bust, statue, living human body, or a vase, flower, &c. The model should be placed somewhat higher than the level of the student's eye, and that the shadows may be clearly defined it should be lighted by a single lamp, or by one window, the lower shutters of which are closed. The learner's first care should be accuracy of outline; next a studious observation of the shading and shadows that give roundness and relief to objects, combined with an earnest aiming at perfect manipulation. These being mastered, boldness of touch and rapidity of execution will follow.

Chalk-drawings are generally executed on a coloured paper, for the purpose of producing a middle tint, so that a drawing on gray or stone-coloured paper will have three degrees or tones of colour—two from the chalks and one from the paper. Charcoal is used to sketch in the outline, which is then matured and made correct with Italian or hard black chalk. The shadows are laid in freely and broadly with soft black French chalk, and then softened and blended together with a stump. Chalk has many advantages over black-lead pencil; more especially it is suited for drawings of large size, and it is by practising on a large scale that freedom and accuracy of hand are mainly to be acquired.

Before attempting to make sketches of landscapes from nature, the student ought to be pretty well acquainted with the general rules of perspective. He may then sketch whatever pleases him, commencing with the foreground and nearest objects, and from them comparing the size and relative positions of the more distant; for instance, if a wall or building come into the foreground of the sketch, from it he may find the position of a more distant object, such as a church, by comparing horizontally what part of the wall the church is opposite, and so on, for the retiring distance. The relative positions of objects on the same plane may be determined in the same way by comparing them perpendicularly with the objects in the foreground over which they are seen. In making studies or finished sketches of single groups of rocks, trees, buildings, &c., it is best to employ black and white chalk and tinted paper. Ruskin's

Elements of Drawing in three Lessons for Beginners may be recommended. See also Hutchinson's *Some Hints on Learning to Draw* (1893).

DRAWING-BOARD, a board on which paper is strained for water-colour painting. It is made of a flat piece of wood held together and prevented from warping by an edging of other pieces, the grain of which runs in an opposite direction. The drawing-paper is first damped and then attached to the edges of the board with thin glue, gum, or paste, and when dry becomes perfectly tight and flat.

DRAYTON (MARKET), or DRAYTON-IN-HALES, a market-town of England, county Salop, pleasantly situated on the right bank of the Tern, 18 miles north-east of Shrewsbury. It has an ancient Gothic church restored in 1884; various other places of worship, and a grammar-school founded in the reign of Philip and Mary. There are foundries and agricultural implement works. On Blore Heath (or Bloore Heath), about 2 miles from the town, a sanguinary battle was fought on Sept. 23, 1459, between the Yorkists and Lancastrians, in which the latter were defeated. Pop. (1881), 5954; (1891), 5089.

DRAYTON, MICHAEL, an English poet, was born at Hartshill, Warwickshire, in 1658. He himself tells us that he was for a time a page and that he was well-born, but little more is known of the events of his life. We know, however, that he was a man of excellent character, a friend of some of the eminent writers of the time, including probably Shakspeare. His first appearance as an author was in 1591, by the publication of *Harmony of the Church*, containing the *Spiritual Songs* and *Holy Hymns* of Godly Men, &c., followed in 1593 by *Idea*, the *Shepherd's Garland*, and *Roland's Sacrifice* to the *Nine Muses*, a series of eclogues. In the same year appeared his *Legend of Piers Gaveston*, and in 1594 his *Matilda*. Drayton's great poem is his *Polyolbion*, in thirty books, of which the first eighteen were published in 1613, and the remainder subsequently. This work is a sort of topographical description of England, and is generally extremely accurate in its details, with, at the same time, many passages of true poetic fire and beauty. It is frequently, however, tedious and obscure, and its extreme length is sufficient to deter many from undertaking its perusal. The gem of Drayton's poems is his *Nymphidia*, the *Court of Fairy*, edited by Sir E. Brydges in 1814. His other works comprise several historical poems, such as the *Barons' Wars* (1603, first issued in 1596 under the title *Mortimeriados*); *England's Heroical Epistles* (1597); the *Legend of Great Cromwell* (1607); the *Battle of Agincourt* (1627); besides numerous legends, sonnets, and other pieces. He died in 1631, and was buried in Westminster Abbey, where there is a monument to his memory.

DREAMS, trains of ideas which present themselves to the mind during sleep. It is pretty generally admitted that during sleep there is always a certain amount of mental activity, of which we may have more or less consciousness at the time and of which we may have more or less subsequent recollection. The principal feature of the state of dreaming is the absence of voluntary control over the current of thought, so that the principle of suggestion—one thought calling up another, according to the law of association—has unlimited sway. Not only can we converse in dreams with persons we fancy to be present, and listen to a coherent reply which they make to us, but we sometimes go so far as to deliver an oration or pen a treatise, which in our waking remembrance may often seem much more clearly and vigorously thought out than if we had composed them by the effort of the will. Cæcilius, in his *Rapports des*

Physique et du Moral de l'Homme, says of Condillac, that he often brought to a conclusion in his dreams reasonings on which he had been employed during the day, and which he had not completed when he went to bed; and of Franklin, that that wise and enlightened man believed that he had been often instructed in his dreams concerning the issue of events which at that time occupied his mind. Coleridge thus describes the circumstances under which the fragment called *Kubla Khan* was composed:—He had fallen asleep in his chair while reading in Purchas' *Pilgrimage* of a palace built by Khan Kubla, and remained in that state for about three hours; during which he could not have composed less than from 200 to 800 lines, if that can be called composition in which all the images rose up before him as things, with a parallel production of the correspondent expressions, without any sensation or consciousness of effort. On awaking he instantly sat down to commit the poem to paper. After he had written the lines subsequently published, he was interrupted for a time, and when he returned to the task the poem had vanished from his memory. The cause of this coherency no doubt is, that when we are awake the attention is more liable to be withdrawn from the train of ideas by external objects. Generally, however, dreams are wanting in coherency; all probabilities and possibilities of time, place, and circumstance are violated. Nothing is more common than for the mind in dreams to combine objects and events which could have had no associated existence. The faces of friends long since dead, and events long since past rise before us sometimes with more intense vividness than in real existence, and cause no surprise by their incongruity, because the mind views them without the association of ideas which, in a waking state, would place them at such a distance from the present time that no cognizance could be taken of them except as very remote events. It is the belief we for the time possess that these trains of ideas are sensations that removes all sense of surprise and incongruity; we have not, together with these apparent sensations, the ideas of the death or the period elapsed, and we are not surprised at seeing, or believing that we see, the persons or events, any more than we would be surprised at seeing, if that were possible, the same persons or events when we are awake, if we did not know that the person had died or that the event was historical. This explanation is confirmed by those instances in which we do feel surprise. The idea of a person or event believed to be seen may call up any of the additional ideas that have before been absent. We fancy we see a person, and then we think of his death; we are immediately surprised, and we have an inner dream that we are dreaming.

Although the predisposing causes of dreams may be various, they may be generally referred to some peculiar condition of the body, and are frequently called into action through the agency of the external senses, the least excitable of which is sight, then follow taste, smell, hearing, and touch, the last being peculiarly excitable. Sensations of physical pain, including those of heat and cold, and sensations in the alimentary canal, have an important influence on dreams. Dr. Gregory relates, that having occasion to apply a bottle of hot water to his feet on retiring to bed, he dreamed of making the ascent of Mount Etna and found the heat intolerable. Dr. Reid having had a blister applied to his head dreamed of being scalped by Indians. Persons in whom one of the senses is defective, have their dreams modified by this circumstance. Deaf persons never have the impression of hearing speech, the blind never dream of visible objects, and it has been observed that a mute when dreaming appeared to carry on a conversation

by means of his fingers or in writing. One notable peculiarity is that when the physical sensation influences the dream, the intensity of it, pleasurable or painful, is considerably increased. Thus if the ear be disturbed by the sounds of a flute, a thousand beautiful and pleasing associations may be invoked; the air is filled with the sounds of harp, or the combined intricate harmonies of a concerted and accompanied piece, and we may call up images of the performers themselves. The rapidity with which we dream is also remarkable. We may seem to live a weary lifetime in the dream of a minute; the sprinkling of a few drops of water on a gentleman's face produced a dream in which the events of a whole life passed before him, ending with a protracted struggle on the borders of a lake into which he was plunged. The whole process must have taken place in a second or two, as the dreamer was aroused from sleep by the application of the water. Some authorities declare that all our dreams take place when we are in process of going to sleep or become awake, and that during deep sleep the mind is totally inactive. This is denied by the majority of philosophers, and with apparent reason.

The belief that in dreams an insight is given into future events was universally prevalent in ancient times, and is shared in to some extent by intelligent people even in our day. Founding on the narratives of dreams in the Bible, and backing them up with illustrations in more recent historical times, combined with some instances that have come under their own knowledge, they construct what they consider a strong case. The non-believers in the reliability of dreams urge that, setting the scriptural instances aside, as belonging to the purely miraculous ages, there have no more dreams been prophetic than an equal number of random guesses; in fact, the wonder is that out of the thousands of dreams one has in a lifetime so few should coincide with an after event. It is also argued that if dreams were sent us as revelations, the true and the false would not be mixed up in such utter confusion, that it would be impossible to distinguish the one class from the other.

DREDGING is commonly applied to the operation of removing mud, silt, and other depositions from the bottom of harbours, canals, rivers, docks, &c. The beds of all large rivers, more particularly those which pass along comparatively flat or alluvial soils, are much encumbered in their channels by banks of sand and small gravel, while on their margins are found the finer or more minute depositions of silt and mud. Large streams, from the great body of water which they bring, and from the greater strength of their currents, will be always able to make a passage; but narrow and winding rivers, with slowly-flowing waters, are often materially injured by the depositions. To such a degree has this been experienced at Sandwich, in Kent, that that ancient seaport is left almost in the state of an inland town. The rivers of Holland, and those flowing through the plains of Italy are likewise thus affected; and according to the impurity of the waters, the entrances of docks and harbours, canals, basins, &c., are more or less silted up, and require to be cleansed or dredged.

The most simple mode of dredging, and probably the one originally adopted for removing the inequalities from the bottom of rivers and harbours, is the spoon dredging-boat. An apparatus of this description was used for dredging the harbour of Leghorn so far back as 1690. The spoon apparatus consists of a strong ring or hoop of malleable iron, about 6 or 7 feet in circumference, properly formed for making an impression upon the soft and muddy ground. To this ring is strongly attached a large bag of bullock's

hide or tanned leather, perforated with a number of small holes, with a capacity of 4 or 5 cubic feet. A long pole or handle is attached to the spoon, and a rope to the bottom of the bag, for directing their position at the commencement of each operation. The pole or handle varies in length and thickness, the length, according to the depth of water, being from 15 to 30 feet. This apparatus is generally worked with a winch, and the chain or rope is brought from the spoon to the winch, through a block suspended from a small crane, for bearing the spoon and its contents to the side of the boat. The purchase-rope is led upon deck by a snatch-block in the proper direction for the barrel of the winch.

The bucket dredging-machine driven by steam has been generally supposed to be of British origin; and it appears to have been first used in England on the Wear about 1796, being subsequently improved by Hughes, John Rennie, and others. It was not brought into general use sooner than ten or twelve years after the commencement of the nineteenth century. At the present day, whenever a continued necessity exists for dredging, the steam apparatus is always employed. The special feature of the steam-dredger is the ladder or frame carrying a succession of buckets on an endless chain, the lower end of the frame being vertically adjustable, so as to allow the buckets to scoop at a greater or less depth. The machine is driven by a steam-engine through the intervention of gearing. In the case of dredgers which discharge the excavated material over the stern a long shaft amidships conveys the motion from the gearing about the engine to a tumbler-block fixed on a frame above the stern, and around which the endless chain revolves. The buckets are of iron, are somewhat scoop-shaped, and have a cutting edge of steel. They cut into the bottom of the water on the under side of the frame, turn on a second tumbler-block at its foot, carry the mud, silt, &c., along the upper side of the frame, and empty it at the top over the first tumbler-block into punts, barges, or hoppers lying close to the vessel. When the materials excavated are to be carried away and deposited on land, punts or lighters are used; when they are to be carried out to sea, hoppers are employed. The latter are vessels driven by steam, having a large tank-like compartment capable of containing 400 to 500 tons of material, and provided with a hinged bottom which can be opened when the place of deposit is reached, and the dredgings easily and quickly discharged. Dredging-machines are sometimes made with single and sometimes with double bucket-ladders, and may be so constructed as to discharge over both sides as well as at the stern. Large dredgers can dredge at a depth of from 30 to 35 feet, and when working on favourable ground will excavate at the rate of 400 to 500 tons per hour.

The *clam-shell* dredger, also known as *grab*, derives its name from the construction of the bucket, which consists of two pieces hinged together horizontally after the manner of a clam-shell, and provided with some mechanism by means of which it can be opened and closed readily by the same power that raises and lowers it. The bucket, suspended from the end of a crane jib, descends open to the bottom, and while there it is filled by closing it. It is then raised and opened in order to empty it. The descent is usually regulated by two vertical poles connected with the crane, and the bucket itself frequently has sharp teeth on its cutting edges to enable it to penetrate hard substances. Various forms of steam-pump dredges, in which suction-pipes are used, have been devised, and such *suction-dredgers* are now in common use.

DRENTHE, a province of Holland, bounded z.

by Hanover, s. and w. by province Overijssel, w. by Friesland, and n. and e. by Groningen; area, 1080 square miles. It is in general more elevated than the surrounding provinces, especially in the centre, from which the ground falls away on all sides. There are also several small lakes. The soil is in general sandy, and large portions of the province are covered with heath and morass, those parts which are elevated forming good land when cleared of turf. The principal grain crops are rye and buckwheat, though barley and oats are also partially cultivated. Excellent flax and hops are also grown. Oak, ash, linden, birch, and other kinds of timber cover a considerable area. The principal wealth of Drenthe, however, is obtained from breeding horses and rearing superior cattle, sheep, swine, and poultry of all kinds. Its capital is Assen. Pop. (1899), 148,542.

DRESDEN, one of the finest cities of Germany, the residence of the kings of Saxony, and capital of the monarchy, is situated in a beautiful valley on both sides of the river Elbe. On the left bank are the Altstadt (Old Town), Friedrichstadt, and other quarters, and on the right the Neustadt (New Town), the Antonstadt, &c. The municipal area received a large extension in 1897. The portion on the right bank called the Neustadt since 1732 is really the older, and was formerly known as Old Dresden. Among the structures worthy of notice are the bridges across the Elbe: the Augustus Bridge, originally built in 1178 and rebuilt between 1727 and 1729; the bridge called the Albert Bridge, a mile above the old one, opened in November, 1877; the Queen Carola Bridge, midway between, opened in 1895 (besides the bridge which accommodates railway and general traffic, and an iron bridge solely for railway traffic); the Sophienkirche or Protestant Court Church; the Roman Catholic Court Church, which contains several fine pictures; the Church of Our Lady, an imposing edifice; the Church of St. John; the royal palace; the law courts; the Museum, a beautiful building, containing a famous picture-gallery and other treasures, and forming a wing of the building known as the Zwinger, which contains zoological and other collections; the Japanese Palace (Augusteum), containing the public library of from 300,000 to 400,000 volumes, besides a rich collection of antiquities; the Johanneum, now containing the collection of porcelain and the historical museum, a valuable collection of arms, armour, domestic utensils, &c., belonging to the middle ages. The royal palace is unattractive externally, but has a fine interior adorned with frescoes, &c., and the Green Vault contains a most valuable collection of jewels and small works of art. The court theatre forms a large and splendid edifice designed by Gottfried Semper, begun in 1871, and opened on the 2nd of February, 1878. The new town-house, the permanent exhibition building, and the new railway-station should also be mentioned. There is a fine park of 300 acres. The city is distinguished for its excellent educational, literary, and artistic institutions, among which are the Polytechnic School, organized much on the plan and scale of a university; several gymnasia and real-schools of the first rank; a military academy; the Conservatory and School of Music; the Academy of Fine Arts; the Royal School for drawing, modelling, &c. The manufactures of Dresden are not unimportant, and are various in character; the china, however, for which the city is famed, is made chiefly at Meissen, 14 miles distant. In Dresden are made articles in gold and silver, mathematical and surgical instruments which bear a good repute, straw hats and plait, artificial flowers, gloves, leather, cigars and cigarettes, musical instruments, chemicals, perfumes, mineral waters, chocolate, playing-cards, &c.

There are large breweries, and in the neighbourhood there are coal-mines, iron and glass works, and manufactories of chemical stuffs, &c. The commerce is considerable, and of late years, since the development of the railway system, the trade with foreign parts has considerably increased. A good deal of business is done with the upper parts of the Elbe, by means of the steamers, which ply as far up as Tetschen. Pop. in 1895, 386,440; in 1900, 395,849.

We may here say a few words on the collections of art. The gallery of pictures, one of the finest in the world, was begun very early, but first became of much importance under Augustus II., king of Poland and elector of Saxony. It owes its most valuable treasures, however, to Augustus III., a prodigal monarch, who exhausted his country by his extravagances. He purchased the greater portion of the gallery of the Duke of Modena for £180,000, and many single pictures, among them Raphael's masterpiece, the Madonna di Sisto. The pictures number about 25,000, and in particular comprise many fine specimens of the Italian, Dutch, and Flemish schools. From the Dutch school there are, among others, some forty Rubenses, twenty Van Dykes, over twenty Rembrandts, besides Ostades, Gerard Dows, Teniers, Wouvermanns, &c. Of the old German school, Holbein's Madonna, a sublime work, is particularly distinguished. Of the French school there are many Claude Lorraines, Poussins, Le Bruns, and others. Of the Italian school the gallery is rich in pictures of Coreggio, including his famous Night; of Raphael, the Madonna di Sisto, the Madonna della Seggiola, and others. There are also works of Leonardo da Vinci, Giulio Romano, Andrea del Sarto, Battoni, Titian (his famous Venus and the Tribute Money), Garofalo, Paul Veronese, Guido Reni, Carracci, Carlo Dolce, and every distinguished Italian painter. This collection is liberally open every day to all visitors. Besides this fine gallery of pictures the museum contains also a collection of engravings and drawings, in all amounting to upwards of 350,000. There is here also a rich collection of casts exemplifying the progress of sculpture from the earliest times, and including copies of all the most important antiques, made under the direction of Raphael Mengs, in Italy. The collection of antiques in the Japanese Palace contains some excellent statues, among which are distinguished three female figures from Herculaneum. The Johanneum Museum contains a historical museum and a large variety of specimens of Chinese, Japanese, East Indian, Sèvres, Meissen, &c., porcelain were arranged chronologically. Dresden being thus rich in treasures of art, and favoured by a beautiful natural situation, is the summer resort of many foreigners.

Dresden is of Slavonic origin, and first came under German and Christian influence after the subjugation of the Slaves about the year 922. At the beginning of the 13th century it is mentioned in documents as a city, and as a residence of the markgraves of Meissen. Since 1485 it has been the residence of the rulers of Saxony. In the first half of the 18th century it was greatly embellished, but suffered much in the Seven Years' war. In 1760 it was bombarded by Frederick the Great nine days. The Austrians occupied the city in 1809 without injuring it. The campaign of 1813 was most ruinous for the city and its environs. From May till about the middle of September it was held by Napoleon, and severe fighting in and around the city took place almost every day. After some years of war and suffering, on the 7th of June, 1815, peace and industry returned to the German Florence, as Herder calls Dresden. After that time dwelling-houses, gardens, and parks took the place of the former fortifications. During the

revolutionary movement of 1849 it suffered rather severely. In 1866 it was occupied by the Prussians, but was evacuated in the following spring. It has been greatly beautified and extended in recent times (especially under the auspices of King John), and its population is rapidly increasing.

DRESS. See CLOTHING.

DREUX (ancient *Duroscassa*), one of the oldest towns of France, department of Eure-et-Loir, on the Blaise, near to where it joins the Eure, 20 miles N.W. Chartres. It is built at the foot of a hill, crowned by a dilapidated castle; has many old buildings, among which are the parish church, an interesting Gothic edifice of the thirteenth century, with a tower of the sixteenth; and the hôtel de ville, of the sixteenth century, containing a museum of antiquities, &c. The castle above-mentioned contains a chapel, founded in 1142; to which has been added the costly mausoleum of the Orleans family, finished by Louis Philippe not long before his expulsion. Dreux has a chamber of commerce, several tanneries, and some trade in grain and other provisions. When it was founded is uncertain; but it had its own counts, and a mint, A.D. 1031. It was long the capital of the county of Drouais, now merged in department Eure-et-Loir. It was taken and ravaged by the Anglo-Normans in 1188. A sanguinary battle took place near the town in 1562, between the Royalists under Montmorency and the Huguenots under Condé, in which the latter were defeated. In 1593 Henry IV. took it by assault after an obstinate siege of eighteen days, in which its defences were much damaged; they were never repaired, and the town soon thereafter decayed. Pop. (1891), 8520.

DRIFFIELD, GREAT, a market town, England, county and 27 miles east by north of York, at the head of a navigable canal, communicating with the Humber at Hull. It consists chiefly of one large and broad street, and has an ancient parish church, several Dissenting chapels, National and others, schools, a mechanics' institute, reading-room, and dispensary. Driffeld has some large flour-mills; it has also works for the manufacture of artificial manures and linseed-cake. Pop. (1891), 5708, (1901), 5766.

DRIFT SAND is sand thrown up by the waves of the sea and blown when dry some distance inland until arrested by large stones, tree roots, or other obstacles, round which it gradually accumulates until the heaps attain considerable dimensions. When these mounds have reached a certain elevation they are urged farther inland. The same wind, says Cuvier, that drives the sand from the sea upon the mound, drives the sand from its summit to its land side. In some parts of the coasts of France, the Landes in particular, these inroads upon the land have been attended with destructive consequences. The quantity of sand annually deposited along that coast is estimated at 3,000,000 cubic feet, and its annual progress inland some 72 feet. Such has been its destructive effects upon a village of Brittany that nothing is visible of it except a portion of the church steeple. For the purpose of arresting the inland progress of drift sand various measures have been adopted, the most successful being the planting of sand-loving plants with long creeping roots, such as *Carex arenaria*, which help to fix the sand and break the influence of the wind.

DRILL.—1. A tool used for boring holes in wood, metal, stone, ivory, &c. It consists of a sharp chisel to which a circular motion is communicated by means of a handle, capable of being turned round easily in a fixed stock, or by a cord, which, being moved horizontally backward and forward, causes the vertical chisel to revolve alternately in the direction of the movement. In machinery and engineering works

the drills are generally driven by the gearing of the factory. The cutting end of this tool has usually a sharp projecting pin in the centre and the edges forming the angle are bevelled in opposite directions.

—2. A fine linen texture of a satiny finish, used for gentlemen's summer dresses. Plain drills are worked with five shafts, fancy patterns with eight.—3. The course of instruction in which a soldier or sailor is taught the use of arms and the practice of military and naval evolutions. It is generally considered that four months' drill is required to fit an infantry recruit for the service.—4. (*Cynocephalus leucophanus*), a species of baboon of a smaller size and less fierce disposition than the mandrill, and like it a native of the coast of Guinea. The face and ears are bare and of a glossy black colour, the palms of the hands and soles of the feet are also naked and of a deep copper colour.—5. In agriculture, a machine for sowing seeds in rows (see following article).

DRILLING is the term applied to the plan of sowing in parallel rows as distinguished from sowing broadcast. It was introduced into England by Jethro Tull, who published a work on the subject in 1731. He saw that mere ploughing and rough harrowing were not cultivation, but only its rudimentary operations; and that the soil required to be stirred and pulverised, not only before sowing, but also after the plants had appeared above ground, in order that weeds might be extirpated and fresh particles of soil brought in contact with the roots of the crop. The plan of sowing in drills or ridges, and hoeing in the intervals was therefore adopted by Tull as the best means to attain his objects. He, however, committed the mistake of fancying that finely divided earth was the food of plants, and condemned the use of manure. The advantage of sowing in drills has stood the test of experience, and drill husbandry, by combining the advantages of continued tillage with those of manure and a judicious rotation of crops, is a marked improvement on the old mode of sowing all seeds broadcast. The crops which are now generally drilled are turnips, potatoes, beans, pease, carrots, clover, cereals, flax, &c. Clover and flax are sown in drills about 3 or 4 inches apart, cereals from 6 to 10 inches, and beans, potatoes, and turnips at from 25 to 28 inches apart. The distance between the rows in the green crops is generally such as to allow the use of a light plough or horse-hoe to be drawn between them without endangering the growing plants. The first form of drill was of very simple construction, and was only adapted for sowing one row at a time. The sower pushed it before him like a small wheel-barrow. The improved form is a much more complicated instrument. It is supported on two wheels and is drawn by a horse. It sows ground bones, ashes, or any other dry manure at the same time with the seed. The seed is let gradually down from boxes in the body of the machine into furrows made by its coulters. Drilling is of more importance on dry than on moist soils, as in the former weeds are more apt to spring up and injure the crops. Among the principal advantages of drilling over broadcast sowing we may mention that a considerable saving of seed is effected in the sowing of grain crops, but the great advantage is that in the case of green crops it enables the farmer more readily to clean the land both by the hand and by the horse-hoe. To keep the soil stirred and pulverised, which can only be properly done when the crops have been drilled, favours the retention and absorption of the moisture.

DRINK. See **DINER.**

DRIPSTONE, a projecting tablet or moulding over the head of a doorway, window, archway, or niche.

DRIVER, in navigation, a quadrilateral sail hoisted

on the misen-gaff and stretched at bottom by a boom. It is the principal fore-and-aft sail, and is of great use in a contrary wind. Sparker is the popular nautical name for this official term.

DRIVING, CARELESS or FURIOUS. Several legislative provisions have been made with the view of preventing accidents arising from carelessness in the driving and managing of wheeled vehicles. Where a fatal accident occurs from negligence or furious driving the person in fault is held guilty of culpable homicide. By 1 and 2 Will. IV. cap. xliii. the driver of a cart, &c., is liable in a penalty not exceeding £5 for riding in the vehicle without double reins; for leaving a cart travelling on the road without a person to guide the beast; for not keeping to the left or near side of the road in passing or while being passed by another vehicle; or for wilfully preventing another person or vehicle to pass. Drivers or owners are liable in a penalty not exceeding forty shillings if more than two carts are under the management of one person; if the last of two carts has more than one horse; or if the horse of the last cart is not attached by the rein to the front cart and following in the same line not more than 6 feet behind. Owners are liable in forty shillings if the driver is under fourteen years of age. The driver of a stage-coach or such public conveyance must not quit his horses or the box, at any place where assistance can be procured before a proper person comes to hold the horses, neither must he permit any other person to drive without consent of a proprietor or against the consent of the passengers, nor quit the coach without necessity or for a longer time than necessary. Drivers of stage-coaches who occasion injury to passengers by misconduct or furious driving may be punished criminally by fine or imprisonment.

DROGHEDA, a municipal town and seaport of Ireland (formerly a parl. borough) in the county of Louth, on both sides of the Boyne, about 4 miles from the sea, 26 miles north of Dublin. Both portions of the town, the area of which has been recently extended, lie partly in hollows, and partly on rather steep acclivities. It consists of four principal streets, which intersect each other at right angles, and of a number of smaller, with numerous lanes and alleys. The greater number of the houses are built of brick, and are in general substantial and well constructed; but there are extensive suburbs composed largely of miserable cabins, which greatly disfigure the approaches. Flax and cotton spinning are carried on in Drogheda and the immediate vicinity to a very considerable extent. Among the other industrial establishments of the town are chemical works, saw-mills, a foundry, breweries, a tannery, &c. Drogheda carries on a pretty large export trade, chiefly with Liverpool. The exports consist principally of corn, meal, flour, cattle, provisions, linen, &c.; and it imports coal, manufactured goods, and colonial produce in considerable quantity. The harbour of Drogheda is formed by the waters of the Boyne, 4 miles from the sea, and extends about half a mile below the bridge, with 16 to 18 feet of water abreast of the quays. At the entrance of the harbour are three lighthouses. The navigation of the Boyne for barges of 50 tons extends inland to Navan, 19 miles.

Drogheda was a principal rendezvous for the forces which were so frequently required in Ulster between the fourteenth and seventeenth centuries. On the breaking out of the rebellion in 1641 it was unsuccessfully besieged by the rebels; in 1649 it was stormed by Cromwell and its garrison put to the sword; and in 1690 it resisted the attack of a division of King William's army. Within 5 miles of its walls was fought the famous 'Battle of the Boyne.' Drogheda was also the seat of many Irish parliaments at

various periods, particularly during the fifteenth century. Pop. in 1891, 11,812; in 1901, 12,765.

DROHOBYCZ, a town of Austria, in Galicia, on the Tysmenica, 41 miles s.s.w. Lemberg. It consists of the town proper and several suburbs; contains two churches, one the handsomest in the country, a synagogue, Basilian monastery, castle, and high school; and has an important trade, chiefly with Hungary, in corn, leather, linen, earthenware, and particularly salt, obtained from salt springs in the vicinity. Near the town are also valuable iron mines and pitch wells. Pop. (1880), 15,714; (1890), 17,784.

DROITWICH, a market-town, municipal, and former parliamentary borough of England, in the county and 8 miles n.n.e. of Worcester, on the banks of the Salwarpe; pop. in 1891, 4021; in 1901, 4163. Droitwich is supposed to have been the Salinae of the Romans, and some Roman remains have been discovered. It is still famous for its brine springs, rising near the centre of the town through strata of red sandstone and gypsum, and from which, as appears from grants to the church of Worcester, salt has been manufactured for more than 1000 years. Much salt is obtained from these brine springs, or wyes, as they are provincially termed, and they are also used as saline baths. Droitwich now gives name to a parl. div. of the county.

DRÔME, a south-east department of France, with a general slope westward to the left bank of the Rhone, but covered almost throughout by ramifications of the Alps, the average height of which, however, does not exceed 4000 feet; area, 2508 square miles, of which about one-fourth is waste, one-third under wood, and a great part of the remainder under tillage and pasture, but the soil possesses little natural fertility, being thin and sandy, and the grain raised falls short of the consumption. A considerable extent of the surface is occupied by vineyards, and several of the wines produced have a high reputation; the most celebrated being those of the Hermitage, grown near Tain, and the wines of Die, Donzère, Chateau-neuf, Montélimar, and Mercuroi. In many districts the olive and mulberry tree thrive well, and large quantities of silk are obtained. Game, including chamois, hares, and partridges, abounds. The wolf is by no means uncommon, and eagles and vultures are occasionally seen. The lakes and rivers are well supplied with fish. The minerals include iron, lead, copper, and coal; limestone, gypsum, and marble, white and veined, are common. The manufactures consist of coarse woollen, serge, printed linens, gloves, leather; and there are numerous dye-works, paper, cotton, and silk mills, several roperies, brick and tile works, and blast-furnaces. Its principal river, the ancient Druna, which gives it its name, divides it nearly into two equal parts, crossing it almost centrally from east to west. It has a course of about 68 miles, through wild and picturesque scenery, and joins the left bank of the Rhone 12 miles south by west of Valence. Drôme is divided into four arrondissements, twenty-nine cantons, and 379 communes. Pop. in 1896, 320,218; in 1901, 294,704.

DROMEDARY. See **CAMEL**.

DROMORE, an episcopal city and market-town, Ireland, county Down, on both sides of the Lagan, here crossed by two bridges, 16 miles south-west of Belfast. It consists of a square and seven well-built streets, and in its cathedral, a small unpretending structure, built by its celebrated Bishop Jeremy Taylor, his remains are deposited. Pop. in 1891, 2559.

DRONTHEIM. See **TRONDHEIM**.

DROPSY, a preternatural collection of serous or watery fluid in the cellular tissue, or different cavities of the body. It receives different appellations, according to the particular situation of the fluid.

When it is diffused through the cellular tissue under the skin, either generally or partially, it is called *œdema* or *anasarca*. An accumulation of fluid in the cavity of the abdomen is termed *ascites*, in the cavity of the chest *hydrothorax* or *hydrops pectoris*, in the cavity of the serous membrane surrounding the heart *hydropericardium*, in the ventricles of the brain *hydrocephalus*, in the scrotum *hydrocele*.

The production of dropsy cannot be understood without a knowledge of the mode in which the various tissues and organs of the body are nourished. In every tissue, with very few exceptions, there are two sets of vessels, blood-vessels and lymphatic or absorbent vessels, and these two sets of vessels are very closely related to one another. Blood is brought to the tissue or organ by an artery of greater or less size, which by dividing and subdividing into smaller and smaller branches distributes the blood to every part of the tissue or organ. The subdivision into finer vessels goes on till the blood is being distributed along vessels of extreme fineness, whose walls are exceedingly delicate, permitting fluid from the blood to pass through them to bathe the tissues. These are the capillary vessels. These vessels gradually reunite, forming small veins, which unite to form larger veins, and so on until the blood brought to the tissue by an artery is finally carried off by a vein, the medium of communication between these two vessels being the exceedingly fine close network of vessels forming the capillary system. The capillary network, then, is the means by which the blood and tissues are brought into communication, the tissues being bathed with fluid passing through the delicate capillary walls, and exchanges between the fluid bathing the tissues and the blood-current through the vessels being possible through the fine walls of the capillary vessels. Now it is quite clear that the quantity of fluid oozing into and bathing the tissues will depend upon the pressure of blood in the vessels. The fuller the vessels are the more will ooze through their walls. This pressure, in turn, will depend upon two things: (1) the quantity of blood brought to the tissue by the supplying vessel—the artery, and (2) the ease with which the blood passes off by the outgoing vessel—the vein. If the supplying vessel, the artery, be very widely dilated, permitting a very large quantity of blood to distend the capillaries of the tissue, it is evident that fluid oozing into the tissues through the capillary walls will be greatly increased. On the other hand, suppose the quantity of blood reaching the part by the artery to be only moderate, but suppose something to be pressing on the outgoing vein, obstructing the flow of blood along it, it is equally evident that still the capillaries will be greatly distended, because the blood passes off from the tissue with difficulty, and the oozing of fluid will again be greatly increased. There are other two circumstances which will have a bearing upon the quantity of fluid escaping from the vessels. If the blood be of a more watery character than usual, it is obvious how a much larger quantity of fluid than usual would bathe the tissues. The state of the walls of the capillaries will affect the amount. If the body be in an enfeebled state the blood-vessels will share the enfeeblement, and by their want of tone permit an escape of fluid more than is usual in a state of health. Even though the body as a whole is in a healthy state, one part of the body, owing to injury, inflammation, and so on, may be in a depressed condition, and the blood-vessels of that part only may, therefore permit an escape of fluid greater than is usual.

Now the question is, What becomes of this fluid which has escaped from the blood-vessels into the tissues, and which is part of the fluid or plasma of the

blood? It bathes the tissues, and yields up to them the nourishment they require. A considerable portion of it will, therefore, be appropriated. But more than is needful to nourish the tissues always transudes from the vessels, and to this there falls to be added the waste products of the activity of the tissues. This forms lymph, and must be removed. In part it is removed by passing back again into the capillaries and being carried off by the veins. But special channels are provided for its removal, namely, the lymphatic or absorbent vessels. These exist in every tissue supplied by blood-vessels, beginning in minute spaces in the tissues, uniting to form larger vessels, and passing to glands in which the removed material undergoes elaboration, permitting it to be poured back again into the blood. These lymphatic channels are in intimate connection with the blood-vessels, the latter being in many instances surrounded by lymphatic channels. Thus, putting it roughly, we have a tissue permeated by fine blood-vessels through whose walls fluid parts of the blood escape to nourish the tissue; originating in the tissue we have fine lymphatic channels by which the excess of fluid, plus waste matters of the tissue, are drained off.

Now we are in a position to understand how dropsy may be produced. It is obvious that the draining-off process by the lymphatics must keep pace with the oozing process from the blood-vessels, or, if it does not, fluid will accumulate in the tissues, constituting dropsy. Dropsy is, therefore, the result of some interference with a natural process of exchange between the blood and the tissues through which it flows. It arises when more fluid passes into the tissues than can be removed by the lymphatics. It ought to be quite evident, then, that dropsy is not a disease in itself. It is a result, a symptom, and it is equally evident that it may be a consequence of a great variety of circumstances. We have indicated in what circumstances a great excess of fluid may ooze through the capillary walls. If there be a great determination of blood to a part, and if the vessels of that part be in an unhealthy state, that part will suffer from dropsical swelling; in short, we will have the puffy swelling in which pressure with the fingers leaves depressions that accompany inflammation of any part. This is the cause of the effusion in pleurisy, to which the term hydrothorax is applied, and of the effusion of fluid round the heart, called hydropericardium. The serous membrane, in the one case of the lungs, in the other of the heart, is inflamed, and more fluid exudes into the serous cavity than the lymphatics can remove, and thus a dropsy occurs. Two of the most common forms of dropsy arise from other causes already indicated. It has been pointed out how some obstruction to the free outflow of blood from a tissue by the veins will greatly increase the escape of fluid into the tissues. This is one of the commonest causes of dropsy—obstruction to the circulation in the veins; and in such cases the dropsy occurs usually chiefly in the most dependent parts, about the feet and ankles. Pressure of tumours upon veins is a frequent cause. Certain diseases of the liver, by obstructing the flow of blood through that organ, cause marked dropsy in the lower limbs and in the belly. The venous blood from the lower limbs and abdominal organs, having to pass through the liver on its way to the heart, any difficulty there will make itself felt in all these parts. But nothing produces dropsy in this way so quickly, and causes it to become so extensive, as some disorder of the heart which impedes the due flow of blood through it. In such a case the dropsy begins in the feet and ankles, and creeps upwards slowly or rapidly according to the extent of the failure of the heart. Another chief cause of dropsy is an alteration of the character of

the blood by which it becomes more watery. The best instance of this is found in kidney disease, attended by albumin in the urine. In these cases the dropsy is first noticed in the face, the puffiness first showing about the eyes. The treatment of dropsy is the treatment of the disease of which it is but a sign—the removal of the obstruction to the venous return of blood, the strengthening of the weak heart, the removal of the kidney disorder. When cure is impossible, relief is often obtained by exciting the removal of water from the body by strong purgatives, by stimulating the flow from the kidneys, by exciting sweating, and so on.

DROSERACEÆ, a natural order of exogenous plants. They are herbaceous, annual or perennial, with alternate leaves. The calyx is either monosepalous, with five deep divisions, or it has five distinct sepals. The corolla is composed of five flat and regular petals. The stamens are five in number, or some multiple of five; they are free, and alternate with the petals. The ovary is one-celled, rarely two or three-celled. The stigmas are sessile and radiating. The fruit is a capsule, with one or more cells, opening by its upper half only into three, four, or five valves. The species are marsh plants, and natives of temperate and warm climates. Some of them are natives of Britain, among others those belonging to the genus *Drosera*, or Sundew, which gives its name to the order. *Dionæa* (the genus to which the plant known as Venus' Trap-fly—*Dionæa muscipula*—belongs) and *Parnassia* are also members of this order.

DROSKY, a kind of light, four-wheeled carriage used by the Russians. It is not covered, and in the middle there rises a sort of bench placed lengthways. When there is only a single person in the drosky he generally throws one leg on each side of this bench, but the conveyance is also capable of holding two persons. The wheels are covered with wings, which keep off the mud. The term is now applied to several other kinds of vehicles.

DROSOMETER (Greek, *drosos*, dew, and *metron*, a measure), an instrument for ascertaining the quantity of dew which falls. It consists of a balance, one end of which is furnished with a plate fitted to receive the dew, the other containing a weight protected from it.

DROUAIS, JEAN GERMAIN, the most distinguished French painter of the school of David, was born at Paris in 1763. Having gone to Rome to study the great works of art there, he was, in 1784, successful in carrying off the great prize, his subject on that occasion being, The Canaanitish Woman at the Feet of Jesus. He was publicly crowned and led in triumph by his fellow-students to their master. He accompanied him as a pensioner to Rome, where he studied and copied the greatest masters. His *Dying Gladiator*, and particularly his *Marius at Minturnæ*, on being exhibited in Paris, gained for him and David's school a new triumph. He now sketched his *Philoctetes at Lemnos*; but his career was suddenly checked by an inflammatory fever, which put an end to his life in 1788, before he had completed his twenty-fifth year, and while he was engaged on a picture of *Caius Gracchus*. His rivals and his friends united in erecting a monument to him in St. Mary's Church (in the Via Lata).

DROWNING is a mode of death produced by immersing the exterior opening of the respiratory tube in a liquid. The immediate cause of death is suffocation or asphyxia, but other causes also enter into the result, and in some cases suffocation may play no part in the result, the person dying from shock during the fall or on striking the water. A serious injury may have been received immediately previous to immersion, the person may have fallen into the

RESTORATION OF THE APPARENTLY DROWNED OR SUFFOCATED—1.

SILVESTER'S METHOD



The movement by which air is made to enter the lungs



The movement by which air is expelled from the lungs. The double movement should be carried on regularly at the rate of 15 times per minute and should be persisted in for an hour where the slightest hope of restoration exists

THE RESTORATION OF THE APPARENTLY DROWNED — II HOWARDS METHOD



When the rescuer is in this position, he should raise his hands and push upwards, causing the chest to expand and air to enter the lungs. He then springs back into the upright kneeling posture and thus allows the chest to return to its former position and the air to be expelled from the lungs. This movement should be repeated regularly 15 times per minute.



In the second position the rescuer spreads his hands wide on the ground and pushing upwards causes the chest to expand and air to enter the lungs. He then springs back into the upright kneeling posture and thus allows the chest to return to its former position and the air to be expelled from the lungs. This movement should be repeated regularly 15 times per minute.

water owing to the occurrence of a fit, epileptic or apoplectic, or may have been attacked by such during the struggle in the water. Thus the appearances found on a body removed from the water will not be uniform. Even in cases where the person was alive on immersion or immediately before it, all these circumstances require to be taken into consideration before a definite conclusion can be arrived at as to the cause of death. The appearances relied upon as indicating that the person was alive when immersed, and that immersion was the cause of death, may be stated. The skin is pale, or somewhat livid, or bloated, and the appearance of goose-skin is found—*cutis anserina*—owing to erection of the hairs by the action of the muscles of the hair-bulbs. The mouth and nostrils are filled with foam, and the tongue is usually swollen and pressing against the teeth. The hands are usually clenched, small articles, such as straw, &c., which have been floating in the water, or mud, &c., being found in them. The penis appears very small owing to extreme retraction. On *post-mortem* examination water is found in the stomach, which may be shown to be of the same character as that in which the body was found. Water is found in the lungs, and the air-passages are filled with froth. The veins and right side of the heart are engorged with blood, and the brain is congested.

Complete insensibility arises in one or two minutes after immersion, but death does not occur for a minute or two later, in from two to five minutes after immersion. Newly born children and young puppies, it has been found, stand submersion longer than the fully grown. So long as the heart continues to beat recovery is possible. In all cases of asphyxia the heart continues to beat even when all effort to breathe has ceased; and as the heart may be feebly pulsating when the person presents no appearance of life, efforts at resuscitation should always be made, in the absence of any authoritative opinion that death has occurred.

The following are the directions for restoring the apparently drowned, issued by the National Lifeboat Institution, founded on the methods of Dr. Marshall Hall and Dr. Silvester (see Plate):—

Send immediately for medical assistance, blankets, and dry clothing; but proceed to treat the patient instantly on the spot, in the open air, exposing the face, neck, and chest to the wind, except in severe weather, and removing all tight clothing from the neck and chest, especially the braces. The points to be aimed at are—first and immediately, the *Restoration of Breathing*; and secondly, after breathing is restored, the *Promotion of Warmth and Circulation*. The efforts to restore breathing must be commenced immediately and energetically, and persevered in for one or two hours, or until a medical man has pronounced that life is extinct. Efforts to promote warmth and circulation, beyond removing wet clothes and drying the skin, must not be made till the first appearance of natural breathing. To Restore Breathing.—Place the patient on the floor, with the face downwards, and one of the arms under the forehead, in which position all fluids will more readily escape by the mouth, and the tongue will fall forward, leaving the entrance into the windpipe free. Assist this operation by wiping and cleansing the mouth. If satisfactory breathing commences, use the treatment described below to promote warmth. If there be only slight breathing, or no breathing, or if the breathing fail, then, to *excite breathing*, turn the patient on one side, supporting the head, and excite the nostrils with snuff, hartshorn, and smelling-salts, or tickle the throat with a feather, &c. Rub the chest and face warm, and dash cold water, or cold and hot

water alternately on them. If there be no success instantly, to *imitate breathing*, replace the patient on the face, raising and supporting the chest on a folded coat or other article of dress. Turn the body very gently on the side, and a little beyond, and then briskly on the face, back again, repeating these measures about fifteen times in a minute, occasionally varying the side. (By placing the patient on the chest, the weight of the body forces the air out; when turned on the side this pressure is removed, and air enters the chest.) On each occasion that the body is replaced on the face, make uniform but efficient pressure with brisk movement on the back, between and below the shoulder-blades on each side, removing the pressure immediately before turning the body on the side. During the whole of the operations, let one person attend solely to the movements of the head and of the arm placed under it. While the above operations are being proceeded with, dry the hands and feet; and as soon as dry clothing or blankets can be procured, strip the body, and cover or gradually recloth it, but taking care not to interfere with the efforts to restore breathing. Should these efforts not prove successful in the course of from two to five minutes, proceed to imitate breathing by Dr. Silvester's method, as follows:—Place the patient on the back, on a flat surface, inclined a little upwards from the feet; raise and support the head and shoulders on a small firm cushion, or folded article of dress placed under the shoulder-blades. Draw forward the patient's tongue, and keep it projecting beyond the lips; an elastic band over the tongue and under the chin will answer this purpose, or a piece of string or tape may be tied round them, or by raising the lower jaw the teeth may be made to retain the tongue in that position. To *imitate the movements of breathing*.—Standing at the patient's head, grasp the arms just above the elbows, and draw the arms gently and steadily upwards above the head, and *keep them stretched upwards for two seconds*. (By this means air is drawn into the lungs.) Then turn down the patient's arms and press them gently and firmly for two seconds against the sides of the chest. (By this means air is pressed out of the lungs.) Repeat these measures alternately, deliberately, and perseveringly about fifteen times in a minute, until a spontaneous effort to respire is perceived, immediately upon which cease to imitate the movements of breathing, and proceed to *induce circulation and warmth*. For this purpose commence rubbing the limbs, upwards, with firm grasping pressure and energy, using handkerchiefs, flannels, &c. (By this measure the blood is propelled along the veins towards the heart.) Apply hot flannels, bottles or bladders of hot water, heated bricks, &c., to the pit of the stomach, the armpits, between the thighs, and to the soles of the feet. If the patient has been carried to a house after respiration has been restored, be careful to let the air play freely about the room.

A simpler method, and one easily applied by one person, is that of Dr. Benjamin Howard of New York. Place the body on its face, with the roll of clothing under the stomach, one arm being bent upwards, so that the hand lies under the forehead. Pull the body by the feet downwards over the roll of clothing. This expels water from the chest. Immediately after this turn the body on the back, place the roll of clothing under the shoulders, so that the head falls back and the neck is stretched. Kneel over the body, one knee close alongside of either thigh. Spread both hands over the lower part of the chest, so that the thumb hooks in under the lowest ribs on each side, the fingers being spread out on the chest. Steadily press forwards, pushing with the weight of the body on the arms, raising the ribs, the operator's

body being thus thrown well forwards over the patient. This enlarges the cavity of the chest, and causes air to enter. When the ribs have been pushed up to their utmost extent, with a slight effort from the arms the operator pushes himself back to the more erect position, and allows the ribs to recoil to their former position, thus expelling the air. This process is repeated fifteen times a minute, and may be maintained for a long period without fatigue. If respiration be restored use the means already indicated to promote the circulation and warmth.

Cautions.—Prevent unnecessary crowding of persons round the body. Avoid rough usage, and do not suffer the body to remain on the back unless the tongue is secured. Never hold the body up by the feet. On no account place the body in a warm bath, unless under medical direction, and even then only as a momentary excitant. The reason for this caution is as follows. When the blood is in circulation carbonic acid is produced, which is removed from the blood by means of the oxygen inhaled in respiration. Consequently, when the circulation is stimulated by the warm bath, while respiration is not proportionally excited, carbonic acid is formed in the blood and remains there, acting as a poison on the patient.

General Observations.—On restoration to life a teaspoonful of warm water should be given; and then, if the power of swallowing be returned, small quantities of warm wine, or weak brandy and water, warm; the patient should be kept in bed, and a disposition to sleep encouraged. Great care is requisite to maintain the restored vital actions, and, at the same time, to prevent undue excitement. It is an erroneous opinion that persons are irrecoverable because life does not soon make its appearance; and it is absurd to suppose that a body must not be meddled with or removed without the permission of a coroner. (For other cases of suspended animation see *ASPHYXIA*.)

DROWNING, formerly a mode of capital punishment in Europe, but now no longer resorted to for that purpose. The last person executed by drowning in Scotland suffered death in 1611, by which time this mode of punishment had already become obsolete in England. In Ireland there was an execution by drowning so lately as 1777.

DROYSDEN, an urban district of England, in Lancashire, situated on an elevated plain, $3\frac{1}{2}$ miles N. Manchester, served by the Lancs. and Yorks. and Great Central railways. The town consists chiefly of one principal street, irregularly laid out, but well kept. There are large cotton manufactories, some copperas works, one or two small dye-works, print works, chemical works, &c. Pop. in 1881, 8887; in 1891, 9482; in 1901, 11,087.

DROZ, the name of three celebrated mechanicians:—

1. **PIERRE-JACQUET**, born at Chaux-de-Fonds in 1721. Aspiring to be something more than a mere workman, he endeavoured to perfect the different parts of clock-work, and succeeded in attaching to common time-pieces, at a small expense, machinery which produced music resembling the chime of bells, and the music of a flute. His attempts to discover the means of effecting a perpetual motion led him to important discoveries. He contrived, among other things, a pendulum, which, being composed of two metals of unequal dilatibility, remained unaffected by heat or cold. He afterwards made his celebrated writing automaton, which, by means of machinery contained within the figure, was made to move its fingers and hands, and to form handsome letters. His last work was an astronomical clock. He died before this was finished, in 1790.

2. **HENRI-LOUIS-JACQUET**, son of the preceding,

born (1752) at Chaux-de-Fonds. From his earliest youth he was employed in mechanical works. At the age of twenty-two he went to Paris with some of the products of his labour; among which was an automaton, representing a young female, which played different tunes on the harpsichord, followed the notes in the music-book with her eyes and head, and, having finished playing, rose and saluted the company. In Paris he caused one of the workmen, taught by his father, to make a pair of artificial hands for a young man who was mutilated, by means of which he was enabled to perform most of the necessary offices for himself. 'Young man,' said the mechanician Vaucanson to Droz, when he saw this work, 'you begin where I should be willing to end.' He died in 1791 at Naples, where he had gone for the recovery of his health.

3. **JEAN-PIERRE**, born in 1746, died in 1822, united himself, in 1783, with Boulton, in Birmingham, for the purpose of striking all the English copper coin. He made for the French mint a stamping-machine, which, with one stroke, and less expenditure of power than is required in the usual process, stamps both sides and the rim of coins.

DRUGGET, a coarse kind of woollen cloth, formerly used by the lower classes for purposes of clothing, but now chiefly used as a covering for carpets, or as a material for making carpets.

DRUGS, supposed to be from the root of *dry*, and hence literally signifying any dried thing, that is dried for the purposes of pharmacy. It is the general name of substances, vegetable, animal, or mineral, used in medicine. The name is also applied to dyeing materials, and to materials used in tanning and other arts. See *PHARMACY*, *MATERIA MEDICA*.

DRUIDS, the priests among the ancient Celts. Julius Cæsar has left more information concerning them than any other writer. According to him, they possessed the greatest authority among the Celtic nations. They were the learned men and philosophers. They performed all public and private sacrifices, explained the doctrines of their religion, distributed all kinds of rewards, administered justice at stated times, and determined the punishment which should be inflicted on offenders. Whoever opposed their decisions was excommunicated by them, and thereby deprived of all share in religious worship. They could even pronounce this curse against a whole people; and, in fact, their power had hardly any limits. They appointed the highest officers in all the cities, and these dared not undertake anything without their advice and direction. They were free from taxes and all public burdens. Instruction in religious and all other kinds of knowledge, the art of war alone excepted, was intrusted entirely to them. They gave oral instruction in the form of verses, which often had a hidden meaning, and which were committed to memory. According to Cæsar, they believed in the immortality of the soul, and its transmigration through different bodies. They taught, moreover, the nature and motions of the heavenly bodies, the magnitude of the universe and the earth, the nature of things, and the power of the gods. They also practised magic and soothsaying. According to Pliny, they were not ignorant of natural philosophy and physics. They had a wonderful reverence for the holy mistletoe, that namely which grows on the oak, on which tree the mistletoe is a rare parasite. This they looked upon as the holiest object in nature, and as a panacea; and Pliny states that at a certain period Druids clothed in white used to go into the woods and cut down the mistletoe with a golden sickle. The sacred groves of the Druids are mentioned by Lucan in the first book of his *Pharsalia*. They likewise esteemed the oak

sacred. Much nonsense has been written on the Druids, about whom we really know very little. The so-called 'Druidical remains' have no claim to this designation. See Rhys's *Celtic Heathendom* (1888).

DRUM, a hollow instrument, either cylindrical in shape with a skin stretched on both ends, or hemispherical with a skin stretched over the top, from which sound is produced by beating with a stick. Cylindrical drums have wooden sides. Hemispherical ones are called kettle-drums, and have heavy brass bottoms. They are always in pairs, one drum being tuned to the key-note, and the other to the fifth of the key. An ordinary small drum is worn at the side, and is beaten with two small sticks on one end. Large cylindrical drums are called bass drums, and are carried in front. The drummer has one stick in each hand, and beats the drum on each end. The skins of drums are tightened sometimes by screws, and sometimes by cords placed at the side. The drums now furnished to the drummers in the British army have screws for the purpose. The peculiar use of the drum for military purposes seems to have been introduced among the Europeans in the time of the Crusades. The drum, as a military instrument, is used both to beat the march and to give signals. No man, who has not experienced it, can imagine the exciting power of the drum. The kettle-drum, the bass drum, and other kinds of drums, are all common in the East. A *drum-head court-martial* was a council hastily summoned in the field to try offences on the spot. It was superseded (1881) by a summary court-martial.

DRUM, a Celtic word signifying a knoll, ridge, or small hill, frequently found alone as the name of a village, farm, estate, &c., and often also as a prefix, as in Drumalbin, Drumderg, Drumlanrig, Drummoisie, &c.

DRUM-MAJOR, in the British army, the title of the non-commissioned officer whose duty it is to teach and direct the other drummers, and whose proper designation now is sergeant-drummer.

DRUMMER, one of the members of a regiment whose office it is to beat the drum. In all the branches of the service he receives slightly more pay than a common soldier. The drummers of a regiment are under the control of the sergeant-drummer. See preceding article.

DRUMMOND, THOMAS, the inventor of the lime ball light known by his name, was born at Edinburgh in October, 1797, and died at Dublin, April 15, 1840. He early displayed great mathematical ability, which induced him to follow the profession of an engineer. For this purpose, after passing through the course at the High School of Edinburgh, he went to Woolwich to receive special instruction in the duties of an engineer, and while still pursuing his studies here he showed his inventive talent by devising a form of pontoon which recommended itself by its facility of transport as well as by its admirable adaptation to the immediate purpose for which it was intended. After completing his studies he was stationed for a time in Edinburgh, and in 1820 he was invited by Colonel Colby to assist him in a trigonometrical survey he was then making of the Highlands of Scotland. During the period he was engaged on these labours he spent each winter in London, where he applied himself to the study of chemistry under Brande and Faraday. Having casually heard the incandescence of lime mentioned in a lecture, it struck him that the light produced by this incandescence might be advantageously applied to replace the Argand-lamps which were used in the surveys, and after devoting a good deal of attention to the subject, he found a means of effecting the desired object. On the first occasion on which the light was employed,

in the Irish survey, begun in 1824, it showed the position of a station 66 miles distant. While on the same survey he invented a heliostat which has always been employed since in land-surveying, and with the aid of which observations can be taken at distances exceeding 100 miles. Drummond was subsequently obliged to retire from the survey on account of a severe illness which he had contracted through exposure to the climate of Ireland. He afterwards returned to his duties on the survey, but soon quitted them again to become Lord Spencer's private secretary. In 1835 he was appointed under secretary for Ireland, and in 1836 he was chairman of a commission on railways in Ireland, and gave in a very valuable report of the proceedings of the commission. His services to Ireland were recognized by the erection of a statue by public subscription.

DRUMMOND, WILLIAM, of Hawthornden, a poet of the seventeenth century, distinguished for the elegance and tenderness of his verses, was born at Hawthornden House, on the Eak, within 7 miles of Edinburgh, 18th December, 1585. He was educated at the University of Edinburgh; after which he spent four years in foreign travels, residing for a part of the time at Bourges, to study the civil law. On his return to Scotland he resigned all idea of the law, and retiring to his romantic seat of Hawthornden, gave himself up to the cultivation of poetry and polite literature. A dangerous illness fostered a serious and devout turn of mind, which was evinced by his first productions, *The Cypress Grove*, in prose, containing reflections upon death; and *Flowers of Zion*, or *Spiritual Poems*. The death of a young lady to whom he was about to be married rendered home insupportable, and drove him again abroad. He remained on the Continent eight years. In his forty-fifth year he was married, and again took up his residence at Hawthornden. Here he entertained Ben Jonson for three weeks on the occasion of a visit which the English dramatist made to Scotland in the winter of 1618-19. To this visit a great deal of interest is attached from the fact that Drummond took notes of the conversations held with Ben Jonson, which were afterwards published, though not till long after the death both of Jonson and Drummond. They first appeared in the folio edition of Drummond's works in 1711, and this circumstance frees Drummond from the charge which has sometimes been brought against him, of having committed a flagrant breach of hospitality in revealing to the world the strictures which Ben Jonson, in the confidence of private conversation, had freely passed on some of his contemporaries. These notes were republished separately by the Shakespeare Society in 1842, edited by D. Laing. He died on the 4th of December, 1649, shortly before completing his sixty-fourth year. As a historian, Drummond is chiefly remarkable for an ornate style, and a strong attachment to the High Church principles of the Jacobites. His *History of the Reigns of the Five Jameses* was published several years after his death. He is now remembered only as a poet. There is much sweetness and melody in his verse, and although tinged with the conceits of the Italian school, there is much genuine imagery and truth of feeling in all his poetry, but particularly in his sonnets, which are replete with tenderness and delicacy. Various editions of his poems have been published, the most recent of which are that, with his *Life* by Peter Cunningham (London, 1838), and that by W. B. Turnbull, 1866. An edition of his whole works was published at Edinburgh, 1711, folio, under the superintendence of Ruddiman. See *Prof. Masson's Life* (1873).

DRUNKENNESS. By the law of England any one found drunk on a highway or public place or in

a licensed house is punishable with a penalty of 10s. for a first offence, 30s. for a second offence within the year, and 40s. for a third offence within the year. To be drunk and riotous, or to be drunk while in charge of a horse, carriage, or gun, renders the offender liable to a fine of 40s., or to imprisonment for one month. In Scotland persons found drunk, and incapable of taking care of themselves, are punishable by a fine or imprisonment; and the same penalties are imposed upon those guilty of drunkenness accompanied by riotous or indecent behaviour in the streets. Local police acts often contain additional regulations. In the eye of the law drunkenness is no excuse for any crime, but a contract is invalid if either party was in a state of complete drunkenness when it was signed. See DRUNKARDS, HABITUAL, in SUPP.

DRUPE, in botany, a simple succulent fruit, containing a hard kernel; such as the cherry.

DRURY LANE THEATRE, one of the principal theatres in London, was established in the reign of James I., under the name of the *Phoenix*. In 1671 it was burned down, and was rebuilt by Sir Christopher Wren between 1672 and 1674, but again consumed, Feb. 24, 1809. On this occasion it was rebuilt by B. Wyatt, and was re-opened on the 10th of Oct. 1812, with an address composed by Lord Byron. It was in connection with this opening that the Smiths (James and Horace) wrote the *Rejected Addresses*. The interior was entirely rebuilt in 1822. This theatre is estimated to be capable of containing more than 3600 persons. Among the celebrated actors who have added renown to Drury Lane Theatre may be mentioned Betterton, David Garrick, John Philip Kemble, and Charles Kemble, Mrs. Siddons, and Edmund Kean. Garrick was at one time part proprietor of it, and John Kemble manager.

DRUSES, a people of Syria, scattered over an extensive tract of country lying to the south-east of Beyrout, and generally speaking south of the country occupied by the Maronites; or, more particularly, they occupy the southern parts of Lebanon and Anti-Lebanon (the slopes of Hermon), while considerable numbers also inhabit the Hauran (south of Damascus), where the mountainous tract occupied by them is now often designated the Druse Mountain. The total Druse population is estimated at from 75,000 to 85,000. In the northern districts occupied by them they are mingled with the Maronites, but many towns and villages are peopled almost exclusively by the Druses. There are some circumstances which tend to show that the Druses are not indigenous to the territory they now possess, although they have long since dropped their own language and adopted the Arabic. It is very commonly believed that they contain an admixture of descendants of the Franks who came to this region in the time of the Crusades, but this is an extremely doubtful opinion. The peculiar interest attaching to this people belongs, however, more to their political constitution and their religion than to their origin. Politically the Druses are divided into two parties, that called the Jumblatiehs, with the family of Jumblat at their head; and the Yazbekiehs, with that of Abou-Nakod at their head. These two parties live in almost constant strife, except when they have a common foe to contend against, when they forget their internal dissensions and unite their strength for offence and defence. Their religion is a curious mixture of Judaism, Christianity, and Mohammedanism. They believe in one God, who is the only being to whom worship ought to be paid. According to their religious books he cannot be defined by any of the qualities belonging to created beings. The doctrine of the unity of the Deity does not admit, in their view, even of the consideration of any quality

or attribute existing in him. They profess to believe in the unity of God with the abstraction of every quality and mode of existence. The Druses also believe that God has at different times appeared to men in a human form, and that his last appearance was under the name of Hakem, of Egypt, who announced himself at Cairo as a divine incarnation about 1080 A.D. They therefore regard Hakem as God, and they believe that he will one day return to earth again, cause their religion to triumph, and punish the unbelieving. They have neither prayers, fasts, nor festivals, and, with the exception of a privileged class, the Akala, or initiated, they have no worship. When they go among the Turks they behave as Mussulmans, and in the midst of the Christian community of the Maronites they enter the Christian churches, and imitate the Christian believers in the use of the holy water. The uninitiated, called Jahils, are exempt from all religious duties whatever. The Druses have also a peculiar moral code. They have seven commandments, a number taken from the sacred writings of the Mohammedans. The following, according to Hama, are their seven commandments:—1, Truthfulness; 2, Mutual defence; 3, Renunciation of all other religions; 4, Separation from evil spirits and perverse men plunged in error; 5, Recognition of the unity of God at all times; 6, Contentment in all labours; 7, Patience in all circumstances. At the end of the sixteenth century this people began to excite attention in Europe. In 1588 they were made tributary to Turkey by Amurath III.; but in the beginning of the seventeenth century recovered their independence under the renowned Emir Fakreddin, and reached the summit of their power; but this leader was in 1635 strangled at Constantinople, and although other princes were placed over them, they never recovered their former reputation. They endeavoured, indeed, by the assistance of the Russians in 1778, to regain their freedom; but they were soon obliged to become again dependent on the Turks. Troubles have more than once broken out between the Druses and Maronites, &c., their neighbours. An outburst of this kind occurred in 1860, and fearful atrocities were perpetrated upon the unhappy Maronites, who, however, seem to have been the original aggressors. But a French force was sent out, and by its intervention tranquillity was restored. Since then, under a Christian governor appointed by the Porte, the Druses have been quiet.

DRUSILLA, a daughter of Herod Agrippa I., king of the Jews, by his wife Cypros. She was only six years old at the death of her father, A.D. 44, but had been betrothed to Epiphanes, son of Antigonus, who, however, refused to complete the match, because one of its stipulations bound him to become a Jew. Azizus, king of Emesa, being less scrupulous, obtained her for his wife, but had not possessed her long when she divorced him to marry Felix, procurator of Judea. She is thus the Drusilla who is mentioned in the Acts, and was probably present when Paul preached before Felix. She had a son, named Agrippa, who perished in an eruption of Vesuvius.

DRUSUS, the name of several distinguished Romans, among whom were:—1. MARCUS LIVIUS (grandfather of Livia, wife of Augustus), who lived a century before Christ. Rome was then divided by the disputes of the senate and the equestrian order. The power of the latter, which, since the time of the Gracchi, had risen to its utmost height, excited the jealousy of the senate, who struggled zealously for their old but now almost lost authority. Drusus endeavoured to gain over the people to the party of the senate by the division of lands, to which the senate agreed with the utmost reluctance, and to

gain the Roman allies by the promise of citizenship. He came forward, relying on this assistance, as a mediator between the hostile parties. He proposed to supply the vacant seats of the senators with knights, and to allow the new magistrates the judicial authority which, from the time of the Gracchi, had belonged to the knights alone, but before that time to the senators. He succeeded in this plan, notwithstanding the most violent opposition from both parties. But the jealousy with which each party guarded its rights, and the rash and violent manner in which Drusus had effected the union, rendered him unpopular with both parties. When, therefore, he proposed to grant the right of citizenship to the allies, for their services to the senate, that body rejected the proposition decidedly, so that Drusus could effect nothing. On his return to his house from an assembly of the people, accompanied by a number of the Latins, he was stabbed at his door by an unknown hand, A.D. 91. He died a few hours after, exclaiming, 'When will the republic again possess such a citizen as I have been!' His death was the signal for the beginning of the social war which had been so long threatening.

2. NERO CLAUDIUS, son of Tiberius Nero and of Livia (afterwards wife of the Emperor Augustus), and brother of Tiberius, who was afterwards emperor, was sent as questor, with his brother, against the Rhætians, whom he subdued. He then suppressed an insurrection in Gaul, defeated the Germans who dwelt beyond the Rhine, passed the river, vanquished the Sicambri, and made the Frisians tributary to the Romans. He was the first Roman general who penetrated to the German Ocean. After these campaigns he became prætor (11 B.C.), but returned in the next spring to Germany, subdued many tribes as far as the Weser, and commenced the erection of fortresses. On this account he was honoured with an ovation at Rome, and was appointed proconsul; the army saluted him with the title of *imperator*, which was not, however, sanctioned by Augustus. B.C. 9 he was made consul, but returned soon after to Germany, and penetrated as far as the Elbe, but was unable to pass the river. He, however, ordered trophies to be erected there to testify his progress. He died in the same year while on his return, in the thirtieth year of his age. The canal uniting the Rhine with the Jssel (*Jossa Drusus*) was his work; and the place called Drusenheim, in Alsace, where he encamped for some time, received its name from him. By his wife Antonia he had a daughter, Livia, and two sons, Germanicus and Claudius, the latter of whom afterwards became emperor. Rome lost in Drusus a man equally distinguished in the field and the council, and one of her most virtuous and noble citizens.

DRYADS, wood-nymphs, in the Greek mythology; supposed to be the tutelary deities of trees in groves, particularly of the oak; whence their name.

DRYDEN, JOHN, one of the most eminent English poets, was descended from an ancient family in the north of England. He was born at Aldwinkle All-Saints, Northamptonshire, August 9, 1631; and received the rudiments of his education at Titchmarsh, in the same county. He was afterwards admitted a king's scholar at Westminster, under the celebrated Dr. Busby, whence he was removed to Trinity College, Cambridge. He left the university without giving any proofs of those talents for poetry for which he was afterwards so much distinguished, unless we may consider as such two or three small pieces disfigured by all the false taste of the age. The family of Dryden was thoroughly tainted with Puritanism, and some of its members held situations of considerable distinction in the Protector's court, and he naturally imbibed the opinions of those around

him. The first theme of importance for his the Death of Cromwell, but the times were unfavourable for poetry. It is questionable whether this piece made any impression on the public mind. The Restoration brought the downfall of Dryden's friends and patrons. Sir Gilbert Pickering, his cousin-german, one of Charles' judges, with whom Dryden lived—in what capacity is not known, though probably in that of amanuensis or secretary—was too happy to escape into obscurity. The influence of Sir John Dryden, his uncle, ended at the same time. He was, therefore, left to find his way to distinction by his own exertions. He joined the Royalist party, and hastened to congratulate the king by publishing, in 1661, the verses entitled *A Panegyric to his Sacred Majesty*. In that age it was considered neither indelicate nor improper for a poet to receive gratuities from those to whom his pieces were inscribed. These, with the income of his small patrimonial estate, were probably the only means of livelihood Dryden at that time possessed. He became, therefore, anxious to form some more certain means of support than was afforded by such occasional contributions, or by literary drudgery to the booksellers. The theatres, which had been early closed by the Puritans, now newly opened, after so long a silence, were resorted to with all the ardour inspired by novelty, and seemed to offer the most promising reward. He accordingly prepared for representation the *Wild Gallant*, which was acted in 1662-63, but without success. Not cast down by his failure he brought forward the *Rival Ladies*, which was well received. His next production was the *Indian Emperor*, a piece ingrafted on the *Indian Queen*, written, or at least published by Dryden in connection with his friend Sir Robert Howard, which had been flatteringly received. The *Indian Emperor* at once raised Dryden to the highest pitch of public estimation, an elevation which he retained till his death.

The great fire of London put a stop for some time to theatrical exhibitions. In the interval Dryden published the *Annus Mirabilis*, an historical account of the events of the year 1666, one of the most elaborate of his productions, though not written in his later and more peculiar style of poetry. In 1668 he also published his celebrated *Essay on Dramatic Poesy*—the first attempt to regulate dramatic writing. The publication of this piece involved him in various controversies, particularly with his brother-in-law, Sir Robert Howard, who was by no means flattered by being, under the name of Crites, made, during the whole of the piece, the champion of unsuccessful opinions. They were, however, soon reconciled. The fame of Dryden was now at its height, and so confident was he of the readiness and ease with which he composed, that he entered into a contract with the king's company of players, by which he became bound to produce to them no less than three plays in the course of the year. This was, however, taking his muse too highly, as he could only produce about half the number contracted for. In 1668 the *Maiden Queen*, a tragico-comedy, was represented, with what success we are not told, though the established fame of its author may warrant us in supposing it to have been well received. This was followed in 1670 by the *Tempest*, an alteration from Shakespeare, in which he was assisted by Sir William Davenant. It was received with general applause, notwithstanding the very questionable taste and propriety of the added characters. Dryden was shortly afterwards appointed to the office of royal historiographer and poet-laureate, with a salary of £300 a year.

From this period till 1681 Dryden's life was passed in dramatic composition, and in representing the

insouciance occasioned by the jealousy of the small wits of the day. In this time he produced about a dozen of plays, mostly with marked success, which was only interrupted by the witty Duke of Buckingham's satirical play of *The Rehearsal* (published at the end of 1671), in which the heroic style of composition was satirized with a power and effect which have seldom been equalled. Long before the period referred to Dryden had become tired of the uninterrupted labours of dramatic writing, and the rivalries of Crowne and Settle, and longed for leisure to engage in an epic poem. He had even gone so far as to select a subject: but the taste of the age was against this species of composition; and the necessities of Dryden compelled him to incessant labour. Stimulated to exertion by the state of parties, he produced, in 1681, *Absalom and Achitophel*, a piece which for powerful yet delicate satire is perhaps unsurpassed by any poem in the language. Its success was so great, that the court party had again recourse to his pen on the release of the Earl of Shaftesbury from the Tower, and notwithstanding Dryden had already in the poem just mentioned drawn his character with unequalled power and felicity, he again, in the *Medal*, sketched with the same masterly hand the leading points of Shaftesbury's history, in a strain in which the beauty of the poetry added additional force to the satire. In retaliation of the slanders and petty impertinences called forth by these vigorous satires, especially those by Settle and Shadwell, Dryden published in 1682 *Mac Flecknoe*, in which both Shadwell and Settle are severely punished.

Shortly after the accession of James II. Dryden became a Roman Catholic, a conversion the sincerity of which has been not unreasonably regarded with suspicion, considering the time at which it occurred. Yet if the sacrifices which his staunch adherence to his new faith at the Revolution, when others of higher name changed their principles without reproach, and when adherence to them was a heavy disqualification, may be taken as evidence of his sincerity, it can hardly be questioned that Dryden was from conviction a sincere Roman Catholic. At court the new convert was received with open arms; a considerable addition was made to his pension, and his pen was put in requisition to defend the cause which he had adopted. The *Hind* and the *Panther*, a polemical poem, in which the controversy between the Romanists and Protestants is allegorically described, which affords the best specimen of the peculiar beauties of his style and its blemishes, and which raised the voice of the nation against him as the avowed defender of James' attempts at establishing arbitrary power, was his first production. It went rapidly through several editions, which is rather to be attributed to the fame of the author, and to the adventitious circumstances in which it was published, than to any disposition to acquiesce in its arguments.

At the Revolution Dryden was deprived of the offices of poet-laureate and historiographer, which were bestowed on his despised opponent Shadwell, a wretched poet, with perhaps just sufficient power of rhyme to vindicate his claim to the honours of the laurel. Deprived of the certain income which these offices secured him, at least during the reign of James, Dryden again turned his attention to dramatic composition. The unpopularity of the party with which he had connected himself, his unfortunate religious tenets, and the exertions his enemies were making for the ruin of his reputation, made him pause ere he again ventured on the stage, and caused him to bestow more care on his next piece than was usual with him. This was his tragedy of *Don Sebastian*, which has been regarded as the chef-d'œuvre of his plays. It

was at first coolly received, though brought out with great splendour, and it was not till several retrenchments and alterations were made that it rose to that high place in public estimation which it so long maintained. His last play, *Love Triumphant*, was acted in 1694; it met with a very unfavourable reception, and is in truth the worst of all Dryden's compositions. During the year previous he had published, in conjunction with Congreve, Creech, and others, a translation of *Juvenal*, and one of *Perseus* entirely by himself. About a third part of *Juvenal* was translated by Dryden, who wrote an essay on satire which was prefixed to the whole.

We now come to the production on which much of Dryden's fame depends, his translation of *Virgil*. On the announcement of his purpose of translating the Mantuan bard, the undertaking was hailed as a national one. Men of learning supplied various editions of the author, and contributed to his assistance in other ways; nor was the public backward in lending their aid. The subscription lists contained the names of most of the noble and learned in the land. It appeared in 1697, and so eagerly was it sought after, that a new edition was called for in the course of the first six months. This great work, which was the fruit of about three years' labour, has been pronounced by Pope, a competent judge, 'the most noble and splendid in any language.'

As if increase of years brought no abatement of poetic feeling, Dryden, now in his sixty-sixth year, had hardly finished *Virgil* when he distinguished himself by his immortal ode to *St. Cecilia*, commonly known by the name of *Alexander's Feast*. He also contemplated translating *Homer*, notwithstanding his age and ill health, and even executed some portions as a specimen. In the meantime he employed himself in the composition of his *Fables*, imitations of *Boccaccio* and *Chaucer*, which were published early in 1700. He survived their publication only a few months. He died May 1st, 1700, in the sixty-ninth year of his age. As if to make amends for their neglect during his life, the great and the noble now hastened to show every mark of respect to his memory. His body was removed to the Physicians' Hall, where it lay embalmed for twelve days; it was then conveyed, with considerable state, to Westminster Abbey, and deposited between the graves of *Chaucer* and *Cowley*.

Dryden married Lady Elizabeth Howard, eldest daughter of the Earl of Berkshire, and sister to his friend Sir Robert Howard. How much this added to his happiness may be questioned. Her ladyship's temper was imperious and haughty; indeed, her wayward disposition—the effect of a disturbed imagination—shortly after Dryden's death degenerated into absolute insanity, in which state she remained till her death in 1714. By her ladyship he had three sons, none of whom survived him ten years. The personal appearance of Dryden ought not to be omitted. In youth he was eminently handsome; but as he advanced in years he became corpulent and florid, which procured him, from the witty and profligate Earl of Rochester, the nickname of *Poet Squab*. In society he was most modest, reserved, and taciturn; his whole demeanour was characterised by a mildness which was not to be expected from his powers of satire. As a poet Dryden stands very high. What was said of *Rome*, adorned by *Augustus*, has been applied by *Johnson* to English poetry, improved by Dryden—he found it of brick, and left it of marble. In his hands it lost the harshness which distinguishes the writings of *Donne* and of *Cowley*, and became eminently harmonious and powerful, but often somewhat turgid. In *Alexander's Feast* he at once raised the ode to its highest elevation, denuded it of

the ceremonies in which his predecessors had bound it, and, in language simple and harmonious, conveys ideas of the most lofty and striking description. His power of satire is unrivalled. While the lesser poets of the day were encumbering it with foul invective, he struck out a new path in the art. His strong and trenchant blade cut deep, while the coarse weapons of his rivals would not penetrate the surface. Of his powers as a tragic poet his Don Sebastian affords the best example. His comedies are unfortunately stained by the licence of the age: they possess in general a certain heaviness of character—a continuous flow of wit was not to be looked for from one who wrote rather for subsistence than from any peculiar taste for this species of composition. Indeed he himself complained that he was 'forced upon composing comedies to gratify the taste of the age, while the bent of his genius was otherwise directed'.

Of editions of Dryden's works we may refer to the prose works by Malone (1800, four vols. 8vo); his poetical works, edited by Todd, with notes by Warton (1812, four vols. 8vo); and the whole of his works by Sir Walter Scott (1808, eighteen vols. 8vo); re-edited with additional notes by George Saintsbury (1883-89). See Dryden in the English Men of Letters Series by Saintsbury (1881), and Garnett's *Age of Dryden* (1896).

DRY PILE, a very important form of galvanic battery, so named from the fact of its requiring merely a slight moisture among its leaves. Various kinds of dry piles are constructed. A very excellent one, Zamboni's dry pile, is made in the following way:—Some sheets of paper, covered on one side with tin-foil or silver, such as are used for ornamental purposes, are moistened with sugar and water, and then rubbed over with very finely powdered black oxide of manganese. These are laid one on the top of the other, the silvered side of one being in contact with the oxide of manganese of the next. They are then cut with a punch into discs of about an inch in diameter, and they are put into a glass tube, care being taken that the order just mentioned is preserved. The tube is fitted at each end with a brass cap furnished with a knob, and it is filled so full that the paper discs are pressed firmly together. From 1000 to 2000 discs may be used. The knob at the oxide-of-manganese end will be found positively electrified, the other negatively. A pile containing 2000 discs will charge a Leyden-jar. The glass tube is generally coated with shellac varnish to improve its insulating power. The sugar with which the paper is saturated is intended for a hygrometric substance. If the pile be carefully kept it will preserve its power for many years. If it be artificially dried it loses it, but will frequently regain it when a sufficient amount of moisture has been absorbed from the air. Its action is quite similar to that of a galvanic battery, or of the Voltaic pile (which see).

DRY-POINT, a sharp etching-needle for incising fine lines on a copper plate, to which neither etching ground nor acid is applied. See **ENGRAVING**.

DRY-ROT, a somewhat inappropriate name for a disease in wood produced by moisture and other causes, and resulting in the growth of a fungus which spreads its mycelium or spawn throughout the tissues, and occasions rapid disorganization. *Polyporus hybridus* is the dry-rot of oak-built ships. *Merulius lacrymans* is the most common and most formidable dry-rot fungus in Britain, found chiefly in fir-wood; while *Polyporus destructor* has the same pre-eminence in Germany. Soaking in creosote will prevent dry-rot; and if timber is properly seasoned, and when built into a structure is not in contact with stagnant air, it is likely to escape. Trees are liable to this disease when grow-

ing in wet and imperfectly drained soil. That wood in a thoroughly dry state may be preserved for long periods is evident from the condition of the timber in some structures belonging to a very remote period. When the disease has set in no means of checking it can be depended on but the removal of the decayed and affected parts and the free admission of the air.

DŖCHAKOWA, or **DYAKOVA**, a town in Turkey in Europe, in the N.E. of Albania, on the Grenik, 63 miles N.E. Scutari. It contains six mosques, a Roman Catholic and a Greek church, and has a population of about 25,000.

DUAL, in grammar, that number or inflection which is used in some languages when two things are spoken of, whilst another number (the plural) exists to express many. The dual in some languages is a firmly-established grammatical form, as in the classical Greek; in other languages it is used only in certain cases with certain words, or only faint traces of it are to be recognized. The Sanskrit has a dual number. Of modern languages which have a literature, Arabic is the only idiom which has retained it. The Anglo-Saxon had a dual in the declension of the first and second personal pronouns; for example, *wit*, we two; *git*, you two; *uncer*, of us two; *incer*, of you two. In the American languages traces of the dual are very often met with from Greenland to Araucania.

DUALISM, **DUALIST**. Dualism is the philosophical exposition of the nature of things by the adoption of two dissimilar primitive principles, not derived from each other: such, for instance, are the ideal and the real, or matter and spirit. Sir William Hamilton divides dualists into natural dualists (or natural realists), who believe that we have an immediate knowledge both of mind and matter; and hypothetical dualists (or cosmæthetic idealists), who believe that we have an immediate knowledge of nothing but mind, but who nevertheless, by various reasonings and arguments, attempt to prove the real existence of an external world. In a stricter sense dualism is confined to (a) the adoption of two fundamental beings, a good and an evil one, as is done in some oriental religions; (b) to the adoption of two different principles in man, viz. a spiritual and a corporeal principle: this is called the *psychological dualism*. One who embraces any such view is called a *dualist*. Opposed to the system of dualism is *monism*, which is either idealism or realism, spiritualism or materialism.

DUBARRY, **COTTESSE**. See **BARRY** (**MARIE JEANNE**, **COTTESSE DU**).

DUBLIN, a maritime county of Ireland, in the province of Leinster, on the east coast of the island, having the Irish Channel E., Meath and Kildare W., Wicklow S., and Meath N. Greatest length N. to S. 82 miles; greatest breadth, 18 miles; area, 226,821 acres, or 354 square miles. Of this area, 73,500 acres are in cultivation, about 120,000 are pasture-land, 4000 are in plantations, 30,000 are in mountain and bog, and 260 are in water. The chief grain crops are oats and wheat. The chief green crop is potatoes. The other crops are barley, turnips, &c. The surface is level, rising at its southern boundary into a range of elevated hills, of which Kippure, the highest, reaches the height of 2473 feet above the sea. The prevailing character of the subsoil is calp limestone and granite. The elevated grounds above the coast in the southern parts of the county are very picturesque, and are occupied by marine villas, and by seats of the nobility and gentry. The northern districts are comparatively level and tame, but are fertile, and covered with a beautiful verdure. There are, in all, about 70 miles of sea-coast, including the bays or inlets of Dublin, Howth, Killiney,

Malabide, and Rogerstown. The principal stream is the Liffey, which intersects the county w. to e. Important water communications are the Royal and the Grand Canals, both centring in Dublin, and uniting the Liffey with the Shannon. The county is not rich in minerals, and the manufactures are unimportant. The fisheries are extensive, and employ above 2000 men and boys. The county is traversed by four railways, which, like the canals, centre in the capital. It is divided into nine baronies, and returns two members to the House of Commons. Pop. (including Dublin city) in 1881, 418,810; in 1891, 419,216, consisting of 322,822 R. Catholics, 77,896 Protestant Episcopalians, 7724 Presbyterians, 4129 Methodists; in 1901, 447,266.

DUBLIN, the metropolis of Ireland, is situated in co. Dublin, within a mile of Dublin Bay, into which the river Liffey runs after dividing the city, through which its course is nearly from west to east, into equal parts. The bay is neither commodious nor safe, particularly in winter. Its defects are remedied, however, by the harbour inclosed within the north and south walls, the latter of which is a magnificent wall of stone running out into the sea for $3\frac{1}{2}$ miles from the south bank of the Liffey, and terminated by a lighthouse. There is also a harbour of refuge at Kingstown. From the point where the Liffey enters the bay it is embanked on either side with a noble wall of freestone, forming a range of beautiful and spacious quays through the whole city. The river is crossed by nine handsome bridges, six of stone, two of iron, and one swing-bridge. Dublin is also nearly insulated by two canals, very important for inland communication. The houses, with the exception of the principal public structures, are generally brick, and from three to five stories high. In the old part of the city the streets are irregular, although those which range parallel to and at right angles with the Liffey are uniform. The main thoroughfare, east to west, is by the magnificent quays along the Liffey, presenting, indeed, one of the finest features of the city, lined, as they are, by elegant buildings; but the river, which is tidal and has the sewage of the city conveyed into it, is often offensive. The principal thoroughfares are towards the south side of the city. Special mention may be made of Grafton Street, the busiest commercial locality in Dublin, and Westmoreland Street, connecting the south side by O'Connell Bridge with Sackville Street, a splendid street 650 yards long and 40 yards wide, containing monuments to O'Connell and Nelson. The O'Connell Bridge, formerly called Carlisle Bridge, was rebuilt and opened for traffic in 1880. It is a magnificent structure, the same width as Sackville Street, and having in the centre a spacious footway. A line of railway, called the 'Loop line', joins the north and south sides of the city, and forms a through connection between the four great railway systems of Ireland.

Few cities possess more numerous or more handsome public buildings. In the centre of the south side stands Dublin Castle, on a slight elevation, originally built early in the thirteenth century. It is now the official residence of the Lord-Lieutenant of Ireland, but is more remarkable for size than for architectural features. The castle chapel is an exquisite specimen of Gothic architecture. East from the castle, and facing College Green, is the Bank of Ireland, formerly the Irish Parliament House, a large and elegant structure, with a noble colonnade of Ionic pillars. At right angles to the bank, and facing the same area, is Trinity College, an imposing modern structure of the Corinthian order. The pile of buildings known as the Four Courts, stretch-

ing along King's Inns Quay, has a beautiful portico of six Corinthian columns, and is surmounted by a large circular lantern; it accommodates the courts of Chancery, Queen's Bench, Common Pleas, and Exchequer, which are now united under the title of The High Court of Justice. The most important of the other public buildings are the custom-house, with a cupola 125 feet high; the King's Inns, the post-office, rotunda, corn exchange, the mansion-house, corporation buildings, sessions house, the Wellington military barracks, Mountjoy convict prison, North and South Union workhouses, south city markets, Christian Union Buildings, Royal College of Surgeons, the Science and Art Museum, the Leinster Hall, and the four railway-stations.

The most important literary and scientific institutions are Trinity College (see next article); the Royal University of Ireland; the Roman Catholic University College; Wesley College; the Royal Dublin Society; the Royal Hibernian Academy of Painting, Sculpture, and Architecture; the Royal Irish Academy; the Archaeological Society; the Royal Zoological Society; &c. The principal libraries, besides that of Trinity College, are the National Library; Marsh's Library, containing about 18,000 volumes; and that of the Royal Dublin Society. At Marlborough House are the extensive buildings in which the National Board of Education has its chief offices. They consist of two training colleges for teachers, with extensive practising schools, professors' offices, and book-stores. In the centre of College Green is an equestrian statue of William III., erected in 1701, and in front of Trinity College are bronze statues of Burke and Goldsmith. There are also statues of O'Connell, Moore, Grattan, Smith O'Brien, Sir John Gray, &c. In the Phoenix Park is an obelisk, 210 feet high, in honour of the Duke of Wellington. Glasnevin Cemetery, to the north of Phoenix Park, contains memorials to O'Connell, the 'Manchester Martyrs', Curran, Hogan, and others.

Dublin contains two Protestant Episcopal cathedrals—St. Patrick's and Christ Church. St. Patrick's Cathedral is an antique building, erected in 1190, decorated with a steeple in 1870, and a very lofty spire in 1750. Between 1860 and 1865 it was restored at a cost of £150,000 by Sir B. L. Guinness, M.P., father of Lord Ardilaun and Lord Iveagh. Christ Church, built in 1038, the ancient cathedral of Dublin, is another venerable pile. In 1878 it was reopened after being restored at a cost exceeding £200,000. St. George's Church is a superb edifice, with a magnificent front and lofty spire. There is a handsome Presbyterian Church in Rutland Square, built at a cost of £14,000. The Roman Catholic Cathedral in Marlborough Street is a very large edifice. The charitable institutions are numerous, and some of them possess splendid buildings. They include among them the Royal Hospital for disabled soldiers, a noble edifice by Sir C. Wren; several infirmaries; the lying-in hospital; two lunatic asylums, one of which, St. Patrick's, or Swift's Hospital, was founded by Dean Swift. The Royal Barracks, affording accommodation for 5500 men, are in the west end of the town, near the river. There are several other military barracks.

A little north-west of the city, up the Liffey, is the Phoenix Park, one of the most extensive and beautiful public parks of which any European city can boast. Its area is 1759 acres; it is adorned with trees, and its surface picturesquely broken into heights and hollows. In the Phoenix Park are the Vice-regal Lodge, the residence of the lord-lieutenant, with gardens and grounds occupying 160 acres; the chief secretary's and under-secretary's official residences; the Royal Hibernian

Military School and the depot of the Royal Irish Constabulary; as also the gardens of the Royal Zoological Society. In 1880 St. Stephen's Green, on the south side of the city, became a public park through the munificence of Lord Ardilaun; and in 1887 Killiney Hill also was opened as a public park by Prince Albert Victor.

The manufactures carried on in Dublin are of little note. The poplins, a fabric of silken warp and woolen weft, for which Dublin has been long celebrated, are still in some request, and brewing and distilling are largely carried on. The trade is important, the shipping entered and cleared having each a tonnage of about 2,300,000 annually. Dublin returns four members to Parliament. Pop. in 1891, 245,001; in 1901, as extended in 1900, 289,108.

DUBLIN, UNIVERSITY OF. The first university of Dublin was founded in 1200, but it gradually declined until, in the reign of Elizabeth, it had wholly disappeared. The present university was founded in 1591, when a charter, or letters-patent, was granted by Queen Elizabeth for the incorporation of the 'College of the Holy and Undivided Trinity'. This college is stated in the charter to be incorporated as the 'mother of an university', whence it appears that it was intended to be only the first of a number of colleges to be afterwards established in connection with the same university, the senate of which is incorporated by a charter distinct from that of Trinity College. Up to this time, however, no other such colleges have been established, so that Trinity College alone still enjoys the rights of the university. The members of the corporation consist of a provost, seven senior fellows, twenty-six junior fellows, and seventy foundation scholars. The management of the college is intrusted to the provost and senior fellows in conjunction with the visitors and the council, the last-named body consisting of the provost, four senior fellows, four junior fellows, four professors who are not fellows, and four other members of the senate. The senate of the university, as incorporated by royal charter, consists of 'the chancellor of the university, or, in his absence, of the vice-chancellor, and such doctors or masters of the university as shall have and keep their names on the books of Trinity College'. The senate possesses, under prescribed conditions, the right of electing the chancellor of the university. It is also the body which grants degrees, subject to the sanction of the college board and of the caput of the senate. This latter body consists of the chancellor or vice-chancellor, provost (or vice-provost), and the senior master non-regent, and every member of the caput has the right of refusing a degree by a veto. The fellows are appointed for life. The senior fellows are promoted from the number of the junior fellows in order of seniority, and every vacancy among the junior fellows is filled up by the provost and senior fellows after a strict examination for twelve days in mathematics, pure and applied, experimental sciences, classics, with Hebrew and cognate languages, and mental and moral sciences. The scholars are chosen from among the undergraduates, after an examination in pure and applied mathematics and logics or experimental science, or in Greek, Latin, and English composition. Non-foundation scholars are not members of the corporation of the college. Scholars receive an annual salary of £20 Irish money, have their commons free of expense, and their rooms for half the charge paid by other students. They hold their scholarships until the end of the June quarter of the fifth year following their election, or following the time at which they become or might have become master of arts, whichever period terminates first. Students, before being admitted, must submit

to an examination in Greek, Latin, arithmetic, English composition, history, and geography. Students may enter as belonging to one of four classes. The first consists of noblemen, noblemen's sons, and baronets. The second consists of the fellow-commoners (who dine at the fellows' table). The third and most important is the class of pensioners, forming the great body of the students. And the fourth is the sizar, who are partially maintained out of the college funds and are now admitted by competitive examination. These last are limited to thirty in number. The academical year is divided into three terms—Hilary, Trinity, and Michaelmas term. To obtain the B.A. degree the student must keep eight terms in all, covering normally four academic years. Terms are kept during the undergraduate course, either by lectures or by examinations, but terms in divinity, law, medicine, and engineering must be kept by attendance on the lectures of the professors. The system of instruction is superintended by the fellows, together with a large staff of professors. Several of the junior fellows act as tutors, and every student must place himself under one of these on entering the college. The tutors during term deliver lectures on the subjects necessary to a degree. These are:—In the first year, mathematics, Greek, Latin, English composition; in the second year, mathematics, mathematical physics, logic, Greek, Latin, English composition; in the third year, logic, mathematical physics, English composition, Greek, Latin, experimental and natural science, astronomy, history, French, German; and in the fourth, astronomy, ethics, English composition, logic, mathematical physics, languages, experimental and natural science, history, and political science. During the first academic year a student is called a junior freshman; during the second, a senior freshman; during the third, a junior sophister; and during the fourth, a senior sophister. Students who have successfully passed all the necessary examinations in the course given above, have the degree of B.A. conferred on them by a grace of the senate in full congregation. Those who wish to obtain honours must pass through a more extended course of study. Honours are attainable in seven departments: 1, mathematics and mathematical physics; 2, classics; 3, logics and ethics; 4, experimental science; 5, natural science; 6, history and political science; 7, modern literature. Those who successfully pass the examinations in any of these departments are placed according to merit as senior or junior moderators, and respondents. Noblemen and noblemen's sons are entitled to have the degree of B.A. conferred on them *per specialem gratiam*; and fellow-commoners are entitled to receive it with one term-examination less than pensioners. The degrees are conferred on commencement days, of which there are four in each year. There are divinity, law, medical, and engineering schools in connection with the university, and degrees or licences in each of these branches are granted by the university senate on the completion of the prescribed courses. The degrees of D.Sc. and Litt.D. are conferred on B.A.'s who have shown certain scientific or literary claims. The degrees of bachelor and doctor in music are also conferred.

The college possesses a fine library of about 300,000 printed volumes and 1700 manuscripts; and the number is increased annually by about 1500 volumes, which are partly purchased and partly obtained under the copyright act. It has also a well-stocked botanic garden and museum. In 1613 James I. granted to the university the right of returning two members to Parliament. One was taken away at the Union, but was restored by the reform bill of 1832. The parliamentary constituency consists of the provost,

fellows and foundation scholars, ex-fellows and ex-foundation scholars, masters of arts, surgery, and engineering, and graduates holding all higher degrees.

DUBNITZA, a town in Bulgaria, 26 miles southwards from Sofia, on the left bank of the Stroma, at the foot of Mount Dubnitsa. The inhabitants are chiefly supported by working iron mines in the neighbourhood. Silk is produced in the locality. Pop. 6000.

DUBOIS, WILLIAM, cardinal, prime minister under the Duke of Orleans when regent of France, was the son of an apothecary, and was born in 1656, in a small town in the province of Limousin. At the age of twelve years he was sent to Paris; and after having studied in the College of St. Michael he obtained the place of private tutor. He next became tutor to the Duke of Chartres, afterwards Duke of Orleans and regent. It was mainly through his influence that the duke married Mlle. de Blois, a natural daughter of Louis XIV., who was much pleased with the match, and rewarded Dubois with the abbey of St. Just, in Picardy. Louis, who had become sensible of his talents, allowed him also to join the French ambassador at London. When he returned to France, under the modest title of a secretary, he soon became the privy-councillor of the Duke of Orleans, and overseer of his household. In 1715 the duke was declared regent; and Dubois now ventured to indulge extravagant hopes. In spite of influential opposition he was appointed by the duke councillor of state. The intrigues of the Spanish court, at that time under the direction of the Cardinal Alberoni, made the duke desirous of a powerfully ally. Dubois directed his attention towards England, and offered to conduct a secret negotiation with the court of that country. He succeeded in overcoming the dislike of George I. to the person of the regent, and in 1717 concluded the triple alliance between England, France, and Holland. He was rewarded by the ministry of foreign affairs, and now began to aspire to the highest dignities of the church. The archbishopric of Cambrai having become vacant, Dubois ventured to request it of the regent, although he was not even a priest. The regent was astonished at his boldness; but as the King of England united with Dubois in his request, he obtained it, and in one morning received all the orders, and a few days after, the archbishopric. By his consummate address he obtained a cardinal's hat, and in 1721 was appointed prime minister. His power had now no bounds; but his excesses had rendered him infirm. He was scarcely able to get in and out of his carriage, and yet he appeared on horseback for the sake of receiving military honours at a review. The exertion caused an internal injury, of which he died, August 10, 1723. Dubois was an avaricious, lying, licentious creature, yet clever and industrious, and able to make himself very agreeable where he suited his interest.

DUBUQUE, a city of Iowa, United States, capital of a county of the same name, picturesquely situated on the right bank of the Mississippi, about 50 miles below the confluence of the Wisconsin. It occupies an important commercial position as an entrepôt for the agricultural and mineral products of the northern half of Iowa, and the timber of Wisconsin, and also from the valuable lead mines in its vicinity. It has numerous manufactures. Pop. in 1890, 30 311.

DUGANGE. See *DURANGE*.

DUGAT, the name of certain gold or silver coins. The name is derived from the It. *ducat*, and that from L. *ducatus*, a duchy. The first issue of these coins has been commonly ascribed to Roger II., Duke of Apulia, who, in 1140, coined ducats bearing the

figure of Christ, and the inscription, 'Sit tibi, Christe, datus quem tu regis iste ducatus' ('To thee, Christ, be devoted that duchy which you rule'). The Venetians followed in coining gold ducats, and called them *zecchini* ('sequins' in English), from *Zecca*, the place where they were coined. They were found to constitute a convenient medium of exchange, were adopted by Genoa, and thus came into general use. This standard of coin was also adopted in Hungary. The value of the old Dutch ducat (a gold coin) was about 9s. 9d. In the Kingdom of the Two Sicilies, before the Italian states were united into one kingdom, a silver ducat was in circulation of the value of about 3s. 5½d. In the new Austrian coinage introduced in 1892 there is a gold ducat of the value of 8s. In some of the South German States, and also in Hanover and Hamburg, there were formerly gold ducats of nearly the same value as the Austrian one, but after the introduction of a uniform monetary system into Germany these ceased to be in circulation. Swedish gold ducats were coined from 1835 till 1868, but they are rarely met with, and have no fixed legal value.

DUCATOON, formerly a Dutch silver coin worth about 5s. 3d. sterling. There were coins of the same name and similar value in the old duchies of Tuscany and Savoy, and in the Republic of Venice.

DUCHESNE, or **DU CHESNE**, ANDRÉ (in Latin, *Chesnius*, *Duchenius*, *Queroclanus*), from his historical researches has been called the father of French history. He was born in 1584, at Isle Bouchard, in Touraine; he studied at Loudun and Paris, was appointed royal geographer and historiographer, and died in 1640. His most important works are his collection of French Historians (*Historiæ Francorum Scriptores*, three vols. 1630–49, to which his son François Duchesne added a fourth and fifth from the papers left by his father); his *Historiæ Normanorum Scriptores ab Anno 838–1220* (1619); and his genealogical works, which throw much light on the history of France. The number of his writings is very great. He left more than a hundred folios in manuscript.

DUCK, a general name for birds of the family Anatidæ, but more particularly restricted to a group of genera comprising *Anas*, *Spatula*, *Drifla*, *Querquedula*, *Mareca*, *Aix*, *Fuligula*, *Harelda*, *Somateria*, &c. The ducks proper are distinguished from the swans (*Cygnus*), comprised in the same family, by having shorter necks; and from the geese, also of the same family, by having shorter necks, and legs less strong and placed farther back. They also subsist largely on insects and other animal food, while the geese and swans live mostly on vegetable food. Among the ducks we may mention the *Mallard*, or *Common Wild Duck* (*Anas boschas*), which is found both in Europe and America. This is the original stock of the domesticated duck, and appears to have been reclaimed at a very early period. It is found in nearly every fresh-water lake and river of the United Kingdom, throughout the north of Europe and Asia, in the greater part of the United States, and in the West Indies. The nest is usually placed by the side of a stream or lake, or in a marsh or bog, among close grass, reeds, and rushes, and may often contain from twelve to sixteen eggs, of a dull greenish-white. The flesh of the wild duck is held in general estimation, and various methods are resorted to in order to obtain these birds in quantities. In Picardy, in France, vast numbers are taken in decoys and sold in the Paris market, where, in one season, 80,000 francs have been paid for the produce of a single small lake. They also abound in Lincolnshire in England, and used to be taken in great quantities by nearly the same means as in Picardy. Pennant had

an account sent him of the produce of ten decoys, which in one winter amounted to 32,200. The number taken in England by means of decoys has greatly decreased, however. Various simple contrivances are made use of in America for the capture of these wary birds. In some ponds frequented by them five or six wooden figures, cut and painted to represent ducks, and sunk by pieces of lead nailed to the bottom, so as to float at the usual depth on the surface, are anchored in such a position as to be within easy range of a sportsman concealed among brush, &c. These attract the passing flocks, which alight, and thus expose themselves to certain destruction. In winter, when detached pieces of ice are occasionally floating in the river, some of the sportsmen on the Delaware paint their boats white, and laying themselves flat in the bottom, direct their almost imperceptibly near a flock before the ducks have distinguished them from a floating piece of ice. On land another stratagem is sometimes practised with great success. A tight hogahead is sunk in the marsh or mud near the place where ducks are accustomed to feed at low water, and where otherwise there is no shelter; the edges and top are artfully concealed with tufts of long, coarse grass, and reeds or sedge. From within this the sportsman watches his collecting prey, and usually commits great havoc. In China the sportsman covers his head with a calabash, pierced with eye-holes, and thus equipped wades into the water, keeping only his head above the surface, and on arriving amidst a flock, seizes them by the legs, fastens them to his girdle, and thus takes as many as he wishes, without disturbing the rest.

Musk Duck, erroneously called *Muscovy Duck* (*Cairna moschata*).—This well-known bird is the largest of the duck kind, and approaches nearly to the size of a goose. It has obtained its name from a strong smell of musk which exhales from its body, and not because it comes from Russia, as has been supposed, since it is a native of South America. The musk ducks are tamed in great quantities in the West Indies, and are found wild in Guiana, where they nestle on the trunks of trees, close upon the water's edge. They feed much upon a plant called wild rice, and are difficult to approach.

Canvas-back Duck (*Fuligula* or *Nyroca vallisneria*).—This delicious bird is peculiar to America, and was known to the epicure long before it was described by the naturalist. We are indebted to Wilson for the first account of it. He gave it the name of the plant on which it feeds, and which had been called after the celebrated Vallisneri. The canvas-back ducks arrive in the United States from the north about the middle of October, and principally assemble in the numerous rivers in the neighbourhood of the Chesapeake Bay. On the Susquehanna they are called *canvas-backs*, on the Potomac *white-backs*, and on James' River *sheeldrakes*. When they first arrive they are very lean; but from the abundance of their favourite food they become fat about November. They are sometimes found in such multitudes as to cover several acres. From the great demand for these ducks, and the high price they always command, various methods are employed to decoy them within gunshot. The most successful is that termed *tolling*, in which they are enticed to approach the shore by means of a dog properly trained. The canvas-back is constantly attended by another species, the American widgeon (*Mareca americana*), which manages to make a good subsistence from his labours. This bird is extremely fond of the tender roots of that particular species of plant on which the canvas-back feeds. The widgeon, which never dives, watches the moment the canvas-back rises, and before he has his eyes well opened, snatches the morsel from his mouth, and makes off.

Among other species of ducks are, *Rhynchosops cygacea*, or shoveller, remarkable for the strange form of its bill. *Chaulelasmus strepera*, or gadwall, which is more rare in America than in Europe. *Dafila acuta*, pintail or uprigtail, remarkable for the form of its tail; abundant in both hemispheres. *Anas obscura*, black or dusky duck, peculiar to America, and very abundant; this is perhaps the most sagacious and timid of all the American ducks. *Anas sponsa*, summer or wood duck; not more remarkable for its great beauty, in which it stands pre-eminent, than for its habits, its migrations being directly opposed to those of the other species. *Querquedula crecca*, or teal. (See TEAL.) *Somateria mollissima*, elder-duck (which see). *Oidemia fusca*, velvet duck, found in both hemispheres; its flavour is rank and fishy, and it is therefore seldom sought after. *O. nigra*, scoter; found both in Europe and America; these birds, and a few others of the same fishy flavour, are exempted from the interdict which forbids Roman Catholics the use of animal food on certain days, on the supposition of their being cold-blooded and partaking of the nature of fish. *Nyroca* or *Fuligula ferina*, pochard or red-head; common to both continents; it approaches very near to the canvas-back in delicacy; its usual weight is about 1½ lb. *Fuligula marila*, scaup-duck or blue-bill, a well known and common species in both continents. *Harelda glacialis*, long-tailed duck, or old wife; common to both continents, remarkable for the long and slender middle feathers of its tail. *Clangula hibernica*, harlequin-duck; a magnificent species found on both continents; it derives its name from the singularity of its markings; along the coast of New England it is called the *lord*.

DUCK, a sort of strong linen cloth, used for men's trousers, smock-frocks, small sails, &c.

DUCK-BILL, or **DUCK-MOLA**. See ORNITHORHYNCHUS.

DUCKING-STOOL. See CUCKING-STOOL.

DUCKWEED (*Lemna*, Linn.), a genus of plants, by some botanists made the type of the small order *Lemnaceae*, by others considered as belonging to the sub-order *Lemnea* of the natural order *Araceae*. The species are small plants which float on the surface of stagnant ponds or slow running streams. The fronds take the place both of stems and leaves, and are usually of a bright green colour. The flowers arise from a slit just below the margin of the frond. Four species are found in Britain, which are distinguished from one another by the shape of their fronds.

DUCKWORTH, SIR JOHN THOMAS, a British admiral, born at Leatherhead, in Surrey, in 1747 or 1748, entered the navy in 1759. Between 1776 and 1779 he served in America. In 1793, on the breaking out of the French war, he was appointed to the command of the *Orion*, 74, forming part of the Channel fleet under Lord Howe, and distinguished himself in 1794 in the great naval victory gained by that celebrated admiral. In 1798, while commanding the *Leviathan* in the Mediterranean under Earl St. Vincent, he acquired new fame at the capture of Minorca. Some years later, when he had obtained the rank of vice-admiral, he was cruising off Cadix as second in command to Lord Collingwood, and set out in pursuit of a French fleet which had sailed to the West Indies to succour St. Domingo. He came up with it after effecting a junction with Admiral Cochrane, and succeeded in capturing an 80 and three 74 gun ships. For this service he received the thanks of both houses of Parliament, and was presented by the city of London with its freedom and a sword of the value of 200 guineas; and by the assembly of Jamaica with thanks and a sword of the value of 1000 guineas. In 1807, having been ap-

pointed to watch the Turkish fleet, he forced the passage of the Dardanelles, but found considerable difficulty in returning, and sustained some damage. Between 1810 and 1815 he was Governor of Newfoundland. In 1813 he was created a baronet. He sat in Parliament for some time as one of the members for South Romney, and died in 1817.

DUCCIOS, CHARLES PINOT (not **PINEAU**, according to Jal), a French novelist, writer of memoirs, and grammarian, born in 1704 at Dinant. He received a good education at Paris, early turned his knowledge to profit, in 1739 was chosen member of the Academy of Inscriptions, and in 1747 member of the French Academy, of which he was afterwards appointed permanent secretary. Though he resided at Paris he was elected mayor of his native town in 1744. When the states of Bretagne, in reward of their zeal for the welfare of the kingdom, were permitted to nominate such of their number as they thought most worthy of the royal favour, Duclos was unanimously elected one of the number, and in 1755 received letters of nobility. He had already in 1750 been appointed to succeed Voltaire as historiographer of France. He died at Paris, 1772. Among the best of his novels are *Confessions du Comte de B.* (1741). His *Considérations sur les Mœurs de ce Siècle* are full of striking sketches of character and deep knowledge of human nature. His *History of Louis XI.* is esteemed, but shows the hand of the novelist. Of more value are his *Mémoires secrets sur les Règnes de Louis XIV. et XV.* This work was composed in his character of historiographer. He also distinguished himself in his *Remarques sur la Grammaire générale de Port-Royal* as a grammarian. His complete works were published at Paris in 1820 in nine vols.

DUCCIOTAY DE BLAINVILLE. See **BLAINVILLE** (**HENRI MARIE DUCROTAY DE**).

DUCTILITY, that property of certain substances through which they may be drawn out into fine wires or threads without breaking; closely allied to malleability, but not quite the same thing. The connection and the difference between the two will be found discussed under **DIVISIBILITY**, where also it is shown that platinum has been found to be of all the metals the most ductile, gold coming next, and other metals following in a certain order. Here we shall not treat of the subject further than to give some particulars in regard to the ductility of glass, which in its ordinary condition is proverbially brittle. When glass, however, is subjected to a sufficient degree of heat it can be managed like soft wax, and may be drawn out into threads exceedingly long and fine. Ordinary spinners do not form their threads of silk, flax, or the like, with half the ease and expedition the glass-spinners do threads of this ordinarily brittle matter. Some of them are made into plumes of filaments much finer than hair, which bend and wave, like hair, with every wind. Two workmen are employed in making them: the first holds one end of a piece of glass over a flame, and when the heat has softened it the second operator applies a glass hook and draws out a thread of glass, which still adheres to the mass; then fitting his hook on the circumference of a wheel about 2½ feet in diameter, he turns the wheel as fast as he pleases till it is covered with a skein of glass thread. The parts, as they recede from the flame, by gradually cooling become more cohesive, and the parts nearest the fire are least cohesive, and consequently must give way to the effort made to draw them towards the wheel. These threads are commonly of a flat, oval shape, being three or four times as broad as thick; some of them seem scarcely bigger than the thread of a silk-worm, and are surprisingly flexible. If the two ends of such threads are knotted together

they may be drawn and bent till the aperture or space in the middle of the knot does not exceed one-fourth of a line or one forty-eighth of an inch in diameter. The flexibility of glass increases in proportion to the fineness of the threads; and, probably, had we the art of drawing threads as fine as those of a spider's web, we might weave stuffs and cloths of them.

DUDA, DUDKA, DUDOTKA, the name of a singular wooden wind-instrument used in some parts of Russia, consisting of two tubes of different length, each with three sound-holes and having a single mouth-piece, thus somewhat resembling the double flute of the ancients.

DU DEFFAND, MADAME. See **DEFFAND**.

DUDESTADT, a very old town of Germany, in the Prussian province of Hanover, 10 miles east from Göttingen, in a fruitful valley at the confluence of the Hable and Breme. It has a fine Catholic church of the fourteenth century, a Protestant church of the thirteenth, an old town-house, &c. It manufactures woollens and cottons, gloves, pianos, cigars, &c., and has a considerable trade. In the middle ages it was a member of the Hanseatic league and a place of some importance. Pop. (1896), 5219.

DUDEVANT, AMANTINE-LUCILE-AUBRE DU-PIR, MADAME, better known by the nom de plume of George Sand, born 5th July, 1804, was the daughter of Maurice Dupin, an officer of the republican army, who was descended from a natural daughter of Marshal Saxe. Until the age of fourteen she was brought up at the Château of Nohant, near La Châtre (department of Indre), mostly under the care of her grandmother, a great admirer of Rousseau and Voltaire, who was at constant feud with her mother about her upbringing. In these circumstances she grew up somewhat wild, and it was agreed to send her to a convent. The English Augustine convent in the Rue des Fossés Saint Victor, Paris, was selected, and here she remained from 1817 to 1820. In 1822 her parents obliged her to marry M. Dudevant, son of an officer and baron of the empire. By this marriage she had a son, Maurice Sand, who has become known as a *littérateur* and as an illustrator of his mother's works. Madame Dudevant's married life proved unhappy, and in 1831 she left Nohant for Paris with L. S. J. Sandeau, a young lawyer. She obtained her livelihood at first by painting fancy articles such as cigar-cases, but began to work at literature in collaboration with Sandeau. After some minor productions in the *Figaro*, she and Sandeau brought out in the *Revue de Paris* a novel called the *Prima Donna* and another called *Rose et Blanche*. These works were brought out under the pseudonym, formed by abbreviation, of Jules Sand. They excited little attention, but the genius of Madame Dudevant had been recognized by Henri Delatouche, under whose patronage her first sole novel *Indiana* was brought out (1832), and who suggested the pseudonym of George Sand. *Indiana* had a brilliant success, but excited much criticism by its extreme views on social questions. This was also the case with the following works, which represented the first stage of Madame Sand's career as an author: *Valentine*, *Lélia*, *Jacques*, *André*, *Leone Leon*, *Simon*, *Mauprat*, *La Dernière Aldini*, *Lavinia*, *Metella*, and others, which appeared within the first few years after her *début*. Up till this time she had formed no systematic views, but according to her own account had worked simply as an artist, her social views being suggested by her own experience. Finding herself accused of being an *esprit fort* and a philosopher, and that she had been writing *St. Simonism* when she only intended to write prose, she determined to discover what was meant by philosophy.

Such is her own account of the transition from the first to the second stage of her career, but a more obvious external cause co-operated in the transition. Her talents and the tendency of her works made some of the leading social doctrinaires eager to convert her to their views. Among her leading teachers were Lamennais, Michel de Bourges, and Pierre Leroux, and the influence of these and others appeared in her following works, which showed a decline in originality and artistic power. Her *liaison* with Sandeau lasted two years. She afterwards visited Italy with Alfred de Musset; and lived eight years with Frédéric-François Chopin, the composer, with whom she visited Majorca in 1838. These relations also influenced or occasioned some of her works (as *Elle et Lui*, 1858). In 1838 she obtained a judicial separation from her husband, with the care of her children. In 1842-43 appeared in the *Revue Indépendante*, *Consuelo*, its continuation the *Countess of Rodolstadt*, and *Horace*, all which belong to the semi-philosophic period. In 1844 she returned to the artistic method, but with a gradual diminution of the intensity of irregular passion displayed in her earlier works. *La Mare au Diable*, *François le Champi*, and *La Petite Fadette* are admirable pastorals; *Jeanne*, *Teverino*, *Lucrezia Floriani*, *La Filieuse*, *Mont Revêche*, *Les Maitres Sonneurs*, *L'Homme de Neige*, *Pierre qui Roule*, *Mlle. de la Quintinie*, *Confession d'une jeune fille*, *Monsieur Sylvestre*, are among her later works, some of which have taken a first rank among French novels. She attempted the drama in 1840, but her early works were failures, and it was not till after 1848 that she succeeded with *François le Champi*, *Claudie*, *Le Pressoir*, *Le Marquis de Villemer*, &c. She took an active interest in the revolution of 1848, and contributed considerably to newspaper and other political literature. In this connection she translated in 1850 *Mazzini's République et Royauté* in *Italie*. In 1854 she published in the *Presse*, *Histoire de Ma Vie*, a psychological autobiography. She died on the 8th of June, 1876, at her residence the Château of Nohant.

DUDLEY, a town of England, in an isolated part of Worcestershire, inclosed by Staffordshire, 8 miles west by north of Birmingham, on the South Staffordshire and Great Western Railways. Among its institutions are a mechanics' institute and a geological society, with a museum rich in mineral specimens, and a free library and school of art. It is situated in the midst of the 'black country'. The coal-fields in the neighbourhood are extensive, and the iron-works are numerous. The principal trades of Dudley consist in the smelting of iron and manufacture of iron goods; boilers, chain-cables, anchors, fire-irons, fenders, vices, spades, sythes, and nails being the principal articles made. Flint-glass is manufactured, as also are ornamental articles of fossiliferous limestone, with which the vicinity abounds. The immense caverns wrought into the limestone rock are remarkable, and interesting to the geologist. There are here the remains of a castle, finely situated on a height, and said to have been founded in the eighth century by a Saxon prince called Dudo or Dud, who has given the town its name. Dudley returns one member to Parliament. Pop. of mun. bor. (1881) 46,252; of parl. bor. 87,527; (1891), 45,740 and 90,223; (1901), co. bor. 48,809, parl. bor. 96,988.

DUDLEY, SIR EDMUND, noted in English history as an instrument of Henry VII. in the arbitrary acts of extortion practised during the latter years of his reign. He was born in 1462, of an ancient and respectable family; and was educated at the University of Oxford. Becoming a student of the law at Gray's Inn, he arrived at such eminence

in his profession as recommended him to the favour of Henry VII., who made much use of his services, and conferred on him various offices and emoluments. In the year 1504 he was made speaker of the House of Commons, and through his influence several enactments took place, oppressive to the people and profitable to the monarch. On the accession of Henry VIII. he was arrested for high treason, and perished on the scaffold, August 18, 1510, with his associate Sir Richard Empson.

DUDLEY, JOHN, Duke of Northumberland, son of Sir Edmund Dudley, minister of Henry VII. He was born in 1502, and after his father's execution was restored in blood by act of Parliament. In 1542 he was raised to the peerage as Viscount Lisle, in right of his mother, who inherited that title. About the same time the post of lord high-admiral was conferred on him for life. He received other honours, served with reputation in Scotland and France, and was left by Henry VIII. one of his executors named in his will, as a kind of joint-regent during the minority of Edward VI. Under that prince he manifested the most insatiable ambition, and obtained vast accessions of honours, power, and emoluments. At first he joined his interest with that of the Duke of Somerset, the king's uncle, whom, however, at length he undermined and destroyed. He had been advanced to the titles of Earl of Warwick and Duke of Northumberland; and after the fall of his rival his authority was almost unbounded. The illness of the king, over whom he had gained complete ascendancy, aroused his fears, and he endeavoured to strengthen his interest by marrying his son Lord Guilford Dudley to Lady Jane Grey, descended from the younger sister of Henry VIII., and persuaded Edward to settle the crown on his kinswomen by will, to the exclusion of his two sisters, the Princesses Mary and Elizabeth. The death of the king, the abortive attempts to place Lady Jane Grey on the throne, and the ruin of all those concerned in the scheme, are among the most familiar events in the annals of England. Northumberland himself was beheaded on Tower Hill, August 22, 1553. He professed himself a Catholic a short time before his execution, and died in that faith, though the avowed object of the plot was to secure the establishment of Protestantism in England.

DUDLEY, ROBERT, Earl of Leicester, was the fifth son of the Duke of Northumberland, and was born about 1532. He was knighted when young, and was made gentleman of the bed-chamber to Edward VI. Though involved in the criminal designs of his father, and included in the sentence of attainder passed against him on the accession of Mary, he was pardoned and employed by that queen. After Elizabeth ascended the throne Dudley soon acquired the distinction of being her favourite. Offices, honours, and wealth were showered on him with an unsparring hand. He was appointed master of the horse, knight of the Garter, and privy-councillor; and he received grants of the princely domains of Kenilworth, Denbigh, and Chirk Castle. In 1560 the death of his wife took place at Cumnor Hall, in Berkshire. This event, according to popular opinion, as appears from Aubrey, involved Dudley in the guilt of murder. If he sacrificed the life of his consort in the hope of marrying the queen, his ambitious views were disappointed. Elizabeth, however, encouraged him to aspire to the hand of Mary of Scotland, not meaning he should obtain it. In 1564 he was created baron Denbigh and Earl of Leicester, and was the same year elected chancellor of Oxford University, having previously been chosen to the same office at Cambridge. In May, 1573, he was secretly married to the baroness dowager Sheffield, Lady Douglas Howard,

by whom he had children, but whom he disowned as his wife, and even compelled to marry another person. In 1575 he gave a princely entertainment to the queen at Kenilworth Castle, the festivities of which are described in a picturesque manner in Scott's celebrated romance of Kenilworth, and, in defiance of chronology, connected with the death of Leicester's first wife. Leicester in 1578 offended the queen by his marriage with the widow of Walter Devereux, earl of Essex. He, however, recovered her favour, and in 1585 was appointed, through her influence, governor of the Netherlands, then recently emancipated from the Spanish yoke. His conduct in this station did not give satisfaction to the queen, or to the states over which he presided, and he was recalled the following year. He returned to his command in June, 1587, but he was finally displaced a few months after, and returned to England. He was accused of misconduct by Lord Buckhurst and others, but Elizabeth still retained so much partiality for him that she supported him against all his enemies; and on the prospect of the Spanish invasion in 1588 she appointed him commander of the forces assembled at Tilbury for the defence of the kingdom. Leicester died September 4, the same year, at Cornbury Park, in Oxfordshire, and was interred in a chapel of the collegiate church of Warwick, where a splendid monument was raised to his memory.

DUEL (from *duellum*, derived from *duo*) is a combat between two, at a time and place appointed, in consequence of a challenge, and so is distinguished from an encounter taking place without any previous arrangement. The custom of duelling was derived from the northern nations; the judicial combat and the private duel, upon the principle of the point of honour, having both been unknown to the ancients. The Germans, Danes, and Franks carried the practice of the judicial combat so far that none were excused except women, sick people, cripples, and such as were over sixty years of age. Even ecclesiastics and monks were obliged to maintain their controversies by a champion in arms; and this singular species of jurisprudence was not confined to criminal accusations, but the titles to estates were decided in the same manner. At length, however, this mode of trial was limited to those accusations of capital offences in which there was no other testimony, and in which common fame pronounced the accused party to be guilty. The party vanquished was punished by hanging, beheading, or mutilation of members. A judicial combat was authorized by Gundebald, king of the Burgundians, as early as A.D. 501. Fleta (bk. 1. ch. 32) says it is a combat between two to prove the truth in respect to their controversy, and the party who conquers shall prevail in the suit. The practice of trying rights to land, as well as the guilt or innocence of an accused party, by combat under judicial authority, very naturally suggested the decision of personal quarrels in the same way (particularly those in which the point of honour was concerned), and all cases in which there was no adequate redress provided in the ordinary tribunals.

The example of Francis I. of France and Charles V. of Spain gave a sanction to this mode of arbitration. On the breaking up of the treaty between these sovereigns and the declaration of war by the French and English heralds at the court of Charles, Jan. 2, 1528, the emperor, in replying to the declaration of the French monarch, desired the herald to acquaint his sovereign that he would henceforth consider him not only as a base violator of public faith, but as a stranger to the honour and integrity becoming a gentleman. On receiving this message Francis immediately sent back the herald with a cartel of defiance, gave the emperor the lie in form, challenged

him to single combat, and required him to appoint the time, place, and weapons. Charles accepted the challenge; but after many messages concerning the arrangements for the combat, accompanied with mutual reproaches bordering on the most indecent sourcery, all thoughts of the duel were given up. But this affair, though it thus terminated without any rencounter, is supposed to have had a great influence in producing an important change in manners all over Europe. Upon every insult or injury which seemed to touch his honour, a gentleman thought himself entitled to draw his sword, and to call on his adversary to give him satisfaction. Such an opinion becoming prevalent among men of fierce courage, of high spirit, and rude manners, where offence was often given and revenge always prompt, led to the sacrifice of many lives. The 'detestable practice of duelling, introduced,' as the Council of Trent says, 'at the instigation of the devil,' raged with the greatest violence in France, where it is calculated that 6000 persons fell in duels during ten years of the reign of Henry IV. His celebrated minister, Sully, remonstrated against the practice; but the king connived at it, supposing that it tended to maintain a military spirit among his people. But afterwards, in 1602, he issued a very severe decree against it, and declared it to be punishable with death; and at the same time commanded any person who had suffered wrong or received an insult to submit his case to the governor of the province, in order that it might be considered by a tribunal consisting of the constables and marshals of France. This decree, however, accompanied by the institution of a tribunal of honour, did not put an end to duels in France. New prohibitions were issued in 1609, 1611, 1613, 1623, 1624, and on numerous other occasions, but they were all powerless to stop the practice. Richelieu was firm in carrying out all edicts by which he hoped to check the power of the nobility, and accordingly insisted on the strict observance of those against duels. Under his ministry the Count of Bouteville-Montmorency suffered death in 1627 for having violated a decree of the French parliament against duelling. This had for a time the effect of deterring others from engaging in this practice. During the minority of Louis XIV. the law was more feebly administered, and more than 4000 nobles are said to have lost their lives in duels; but afterwards Louis XIV. showed as much severity in repressing them as Richelieu himself had done. The rage for duelling was rekindled in the eighteenth century, in spite of a royal decree of 1723. With the revolution of 1789 commenced the period of legal impunity for duels, and a new class of duels became common, those, namely, between men engaged in politics. Bills, with a view to put down the practice, were brought forward in the chambers in 1829 and 1830, and a similar proposal was made to the Council of State in 1832; but they were not accepted. At last, in 1837, the Court of Cassation determined to follow a new law with regard to duels, and protesting against the practice in the name of morality and law, it decided that in case of death or injury resulting from a duel, the principal parties and the seconds should be proceeded against and punished in accordance with the general provisions of the *code pénal*. The French courts, however, reserve to themselves a discretionary power in dealing with cases of duelling, and the practice is by no means yet obsolete in France.

Single combats are said to have been introduced into England by the Normans. In the time of chivalry numerous single combats took place in England, which, in the proper sense of the term, can scarcely be called duels. It may be said that the duel, strictly so called, was introduced into England about the

same time that it became common in France, such was the contagion of the example of Francis I. and Charles V. In the reign of James I. of England there were numerous cases of duelling, the most celebrated of which is that in which Lord Bruce and Lord Sackville (afterwards Lord Dorset) were the principals, and in which the former was killed. The Cavaliers were extremely sensitive on the point of honour, as Sir Walter Scott shows in the admirable delineation which he furnishes us with in Woodstock of the ideas and manners which prevailed in that party. Cromwell was an enemy of the duel, and during the protectorate there was a cessation of the practice. It came again into vogue, however, after the Restoration, thanks chiefly to the French ideas that then inundated the court of St. James. Some of the duels of that epoch are in perfect accord with the loose morality then prevalent. An instance of this is the duel in which the Duke of Buckingham killed the Earl of Shrewsbury, while the wife of the latter, the cause of the duel, who had accompanied the duke to the ground, witnessed the encounter in the dress of a page. A striking thing is that as society became more polished in England, duels became more frequent. They were never more numerous than in the reign of George III. Among the principals in the fatal duels of this period were Charles James Fox, Sheridan, Pitt, Canning, Castlereagh, the Duke of York, the Duke of Richmond, and Lord Camelford. The last-mentioned was the most notorious duellist of his time, and was himself killed in a duel in 1804. Of all the duels which have taken place during the reigns of George IV., William IV., and Queen Victoria the most celebrated is that which was fought between the Duke of Wellington and Lord Winchelsea in 1829, the cause of which was certain animadversions which Lord Winchelsea had passed on the Duke's conduct in connection with the Catholic Emancipation Bill. The duel passed off without any injury being done to either of the parties engaged. The Duke of Wellington missed his aim, whereupon Lord Winchelsea fired into the air and apologized. The last duel which attracted some attention in England was that between the Earl of Cardigan and Captain Tuckett. Since that time, partly owing to the fact that public opinion has set itself strongly against duelling, and partly to the fact that this change of public opinion has led to a more rigorous enforcement of the laws against duellists, the practice may almost be said to have become extinct in England. Even in the army duelling is now rare, since the offence is now, according to the Articles of War promulgated in 1844, one for which any person concerned in it may be tried by court-martial and cashiered, or punished in any other way the court may think fit.

As in France so in Germany the practice of duelling is not yet extinct. Indeed in the army it is recognized by law as having a certain defined position. It is still also not uncommon at the German universities, though the duels of the students are seldom serious affairs, being rather fencing matches with sharp weapons than duels proper. The combatants are generally padded all over the body except the face and sword-arm. Recently, however, some of the student duels have terminated fatally.

DUET, a musical composition for two voices or instruments.

DUFRENE, or **DU FRENE**, CHARLES, SEIGNEUR DU CANGE, hence often called *Ducange*, a man of letters, who did much for the history of the middle ages, especially as regards his own country, as well as for the Byzantine history. He was born in 1610, at a farm near Amiens, of a respectable family, and studied in the Jesuits' College at that place, after-

wards at Orleans and Paris. At this last place he became parliamentary advocate in 1681, and in 1645 royal treasurer at Amiens, from which place he was driven, by a pestilence, in 1688, to Paris. Here he devoted himself entirely to literature, and published his great works, viz. his Glossaries of the Greek and Latin peculiar to the Middle Ages and the Moderns; his *Historia Byzantina* (Paris, 1680, fol.); the *Annales of Zonaras*; the *Nomenclatus of the Middle Ages*; and other important works. He died in 1688.

DUFRESNY, CHARLES RIVIERE, a French comic poet, born at Paris in 1648; died in 1724. Being a man of talent, and passing for a great-grandson of Henry IV. of France and *la belle jardinière d'Auget*, he was well received by Louis XIV., who made him his valet de chambre. He was afterwards appointed manager of the royal gardens, on account of the strong love of flowers which he manifested, and in this capacity he introduced into France the taste for gardens in the English style. He received various other gifts from the king and the regent, but they did not suffice to meet his extravagance, and he died in reduced circumstances. Among his dramatic pieces may be mentioned *L'Esprit de Contradiction*, a one-act play in prose; *Le Mariage fait et rompu*, written in verse, and a second prose piece in three acts, called *Le Double Veuvage*. He is also the author of a romance in which he depicts the manners of the time after the fashion of *Le Sage*. It is called *Les Amusements sérieux et comiques*. His complete works were published in six vols. in 1731. Selections from his works were published by Anger in two vols. in 1810.

DUGDALE, SIR WILLIAM, an English antiquary, born in 1605, of a good family in Warwickshire, early devoted himself to the study of native antiquities, and formed an intimate acquaintance with other learned men engaged in the same pursuits, particularly the celebrated Henry Spelman, whose interest obtained for him the appointment of a purveyor-at-arms. He was afterwards, in 1640, made *rouge-croix* purveyor, and had apartments in the heralds' office, with ample opportunities for his favourite study. During the rebellion he accompanied Charles I. in his campaigns. He was some time in Oxford before it capitulated to the Parliament in 1646, immediately after which he repaired to London, and in concert with Dodsworth completed his collections out of the Tower records and the Cottonian Library. These formed an important part of the *Monasticon Anglicanum* (1655 to 1673), in which, however, Dodsworth had the principal share. The principal work of which Dugdale had the sole merit is the *Antiquities of Warwickshire*, published in 1656. At the Restoration he was appointed Norroy king-at-arms, and in 1677 Garter king-at-arms, with the honour of knighthood. He died in 1686, at the advanced age of eighty-one. Besides the works already mentioned, he published the *Baronage or Peerage of England*, in three vols. folio (1675-76); *Origines Judiciales*, or *Historical Memoirs of the English Law, Courts of Justice, &c.* (1666); a *History of St. Paul's Cathedral* (1658); and various minor writings. He also completed and published the second volume of Spelman's *Concordia*.

DUGONG (*Halicore*), a genus of Cetacea, characterized by an elongated body, a broad caudal fin of a crescent shape, thirty to thirty-two teeth, of which four above and six to eight below are incisors, and five on each side of both jaws are molars. It has no canines. Its skin is very thick, but without hair, though its upper lip is beset with strong bristles; and others are found more sparingly on different parts of its body. The only species known are the *Halicore Indicus* of Fr. Cuvier, and another, discovered in the

Red Sea by Rüppell; and called *Haliscore tabernaculi*. The latter is perhaps only a variety of the former, which, as its name implies, belongs to the Indian Archipelago. It frequents shallow shores covered with the marine plants on which it feeds, and lives in herds, which defend themselves mutually, and often attack small fishing vessels. The Malays consider the fish as delicious. There is reason to apprehend that in the course of a few years the race, already much thinned by fisheries, will become extinct. See Plate at OCTAGRA, fig. 6.

DUGUAY-TROUIN, RENE, a distinguished French seaman, was the son of a rich merchant and skilful navigator, and born at St. Malo in 1878. He made his first voyage in 1689 in a vessel of eighteen guns which his family fitted out in the war against England and Holland. His courage induced his family to treat him with a ship of fourteen guns. Being driven on the coast of Ireland he burned two ships and took a fort in spite of the opposition of a numerous garrison. He was once taken prisoner, and carried into Plymouth. He there gained the love of an English female, who procured him his liberty. He once more made a cruise on the coast of England and took two ships of war. Duguay-Trouin, now in his twenty-first year, attracted the attention of the government. Louis XIV. sent him a sword. He captured great numbers of English and Dutch ships on the coast of Spain and Ireland; in 1696 he took a great part of the outward-bound Dutch fleet under Wassenaar; in 1697 he entered the royal marine as a captain. He signalized himself so much in the Spanish war that the king granted him letters of nobility, in which it was stated that he had captured more than 800 merchant ships and twenty ships of war. By the capture of Rio de Janeiro (1711) he brought the crown more than 25,000,000 francs. Under Louis XV. he rendered important services in the Levant and the Mediterranean. He died at Paris, 1736. His memoirs appeared there in 1740 in four vols. His Eloge was written by Thomas.

DU GUESCLIN, BERTRAND, Constable of France, renowned for his talent and courage, was born about the year 1314 at the castle of Motte-Broon, near Rennes. According to the descriptions which remain of him he was of a vigorous frame, with broad shoulders and muscular arms. 'I am very ugly,' said he when a youth; 'I can never please the ladies; but I shall at least know how to make myself terrible to the enemies of my king.' At the age of seventeen he won the prize at a tournament at Rennes, where he had gone against the will and without the knowledge of his father. From this time he was always in arms. After the disastrous battle of Poitiers in 1356 he came, while King John was yet a prisoner, to give assistance to his eldest son, Charles, who then held the regency. Melup surrendered; those of his party obtained their freedom, and many other towns yielded to him. Charles V., who in 1364 had succeeded his father, rewarded in a suitable manner the services of Du Guesclin, who in the same year gained a victory at Cocherel over the forces of the King of Navarre, commanded by Captal de Buch. But at the end of the war in Brittany he was obliged to surrender himself to Chandos at D'Auray. After being liberated on ransom he gave his support to Henry of Transtamara, who had assumed the title of the King of Castile against his half-brother, Peter the Cruel. He succeeded in establishing Henry on the throne of Castile, but Peter the Cruel then summoned the Black Prince and Chandos to his aid, and a check was thus put to the victorious career of Du Guesclin. He was defeated and taken prisoner at Navarete in 1367, but was soon ransomed, and by the victory of Montiel re-established Henry on the throne in 1369.

In 1870 Du Guesclin was made Constable of France, and soon after returned to his native country to defend it against the English. The latter, hitherto victorious, were now everywhere beaten. They were deprived of all the territories they possessed in France, retaining only a few of the chief towns on the coast. He died in the midst of his triumphs before Orléans-de-Bandon, July 18, 1880.

DUISBURG, a manufacturing town and inland port of Prussia, in the Rhine Province, in the angle between the Rhine and its tributary the Ruhr, about 18 miles north of Düsseldorf. The town has civic, educational, and other institutions in keeping with its importance. The finest of the churches is the fourteenth-century Salvatorkirche, with fine wall-paintings, &c. Duisburg has blast-furnaces, foundries, and other works depending on the iron trade; chemical works, cotton-mills, and weaving-factories; brass and copper works, breweries, &c. It has commodious basins for shipping, and does a very large trade by rail, river, and canal. It is an ancient place, early rose to be a free town, and became a member of the Hanseatic league. It possessed a university from 1655 to 1818. Pop. in 1895, 70,272; in 1900, 83,605.

DUJARDIN, KARL, a Dutch artist, who excelled in painting landscapes, animals, and scenes in low life, was born in 1640 at Amsterdam. He went to Italy when young, and was a member of the Society of Painters at Rome, among whom he was called *Barba di Becco*. His works met with general approbation. On his way home to his native country he contracted considerable debts at Lyons, to free himself from which he married his old and rich landlady. He went with her to Amsterdam, where his pictures were valued very highly. He soon secretly left his home in that city, probably from dislike to his wife, and went to Rome, where he was welcomed by his old friends and admirers, and lived at great expense. Thence he went to Venice, where he died, in 1678, in the prime of his life. His landscapes have spirit and harmony, his figures expression, and his colour the brilliancy which distinguishes his school. His paintings are rare, and command a high price. He also published fifty-two landscapes etched with much spirit and ease.

DUKE (in French *duc*, in Spanish *duque*, in Italian *duca*, all derived from the Latin *dux*, leader, commander), a title belonging originally to a military leader. Gibbon says the title came into use when Constantinian separated the military and civil commands of the provinces; the title *dux* was then applied to the military governor of a province, and for a time the ducal rank was considered inferior to that of the *comes* (count). The Goths, Franks, and other northern tribes who invaded the vast Roman territories, adopted, if they had not before borrowed, the titles of duke and count. Among those warlike peoples, however, the dukes, as military chiefs, soon acquired a marked pre-eminence over the counts, whose functions in the Eastern and Western Empires were more of a civil and judicial nature. Under Charlemagne, who was jealous of the increasing power of the higher nobility, the dignity was suffered to cease, but under his weaker successors the ducal governors of the provinces attained an almost absolute independence. The concession of hereditary power and independent jurisdiction, first to the central provinces known as the Isle de France, and then to Aquitaine, extended itself under the Carlovingians to Burgundy, Normandy, and Gascony, and on the accession of Hugh Capet to all the other subaltern tenures. It was not long until the dukes, feeling secure in the unlimited governing power of their provinces, proclaimed their title to be as good as that of the king. They coined money, assumed the crown and sceptre, gave law to their subjects,

made war even against the king, and reduced the royal jurisdiction to a few towns such as Rheims and Leon. Under the Capetians, however, these duchies were gradually reunited to the crown, and those subsequently accorded to the members of the royal family enjoyed none of the privileges of independent sovereignty. Prior to the revolution dukes were created by letters patent of the king, and were of three kinds, and those designated as dukes and peers held the first rank and had a seat in parliament. The dignity of the second class descended to their male children, but that of the dukes by brevet ceased with themselves. The rank of duke in the royal family of France was superior to that of prince, and sometimes inferior to that of count. The ducal, along with all other titles of nobility, was abolished at the revolution, but was restored by Napoleon in 1806. In Germany the dukedom passed through phases similar to that exhibited in France. In 847 the Emperor Louis appointed a duke (*Herzog*) of Thuringia to protect the frontiers against the Wendes, or Vandals, a Slavonic tribe. The power of the dukes gradually increased, their dignity became hereditary, and they soon became powerful members of the German Empire. An Archbishop of Cologne, Bruno, was the first who bore (in 959) the title of archduke (*Erz-herzog*), which since the time of the Emperor Frederik III. (1453) has been given exclusively to the princes of the house of Austria. All the Austrian princes are archdukes, as a distinguishing title of the imperial family. In Britain the title of duke ranks as a title of honour or nobility next below that of a prince or princess of the royal blood and that of archbishop of the Church of England. The first hereditary duke in England was the Black Prince, created by his father, Edward III., in 1366. The duchy of Cornwall was bestowed upon him, and was thenceforward attached to the eldest son of the king, who is considered a duke by birth. The duchy of Lancaster was soon after conferred on his third son, John of Gaunt, and hence arose the special privileges which these two duchies still in part retain. In the reign of Elizabeth, in 1572, the ducal order was extinct, and not revived till the creation of Villiers, duke of Buckingham, and Ludovic Stuart, duke of Richmond, by James I. There are over thirty dukes on the British peerage rolls, including those of the blood-royal. The coronet of a British duke consists of eight strawberry leaves of a conventional type on a rim of gold. In the Bible the word *dukes* is used, Gen. xxxvi. 15, for the *duces*, that is, chiefs or leaders, of the Vulgate.

DUKE OF EXETER'S DAUGHTER, a rask in the Tower of London, so called after its inventor, a minister of Henry VI. According to Blackstone it was never put in use.

DUKINFIELD, a borough of England, in the north-east of the county of Chester, separated by the river Tame from Ashton-under-Lyne (which is situated in the county of Lancaster), and forming a part of the parliamentary borough of Staleybridge. It has several churches and also chapels belonging to various bodies of Dissenters, literary institute and technical school, &c. Extensive collieries, cotton factories, engineering, brick and tile works give employment to the greater part of the population. Pop. in 1881, 16,943; in 1891, 17,408; in 1901, 18,929.

DULCAMARIN. The *Solanum dulcamara*, bitter-sweet, or woody nightshade (see NIGHTSHADE), an indigenous plant, is used in medicine. The young twigs dried, bruised, treated with water, and strained, give an infusion which is used externally in skin diseases, and internally as a sudorific and alterative. The plant has been analyzed, but the results do not quite agree. It contains, according to one chemist, a substance called by him

dulcamarin, which is separated from the aqueous extract with some trouble, and forms a yellow, transparent, resinous, easily powdered mass, readily soluble in alcohol, but sparingly so in ether, and very slightly soluble in water. It has a slight alkaline reaction, and gives a platinum salt. By a different process a body can be separated which has some of the properties of an alkaloid, but is almost inert physiologically. Solanin (which see) has also been obtained from bitter-sweet.

DULCIGNO, a small seaport town, formerly in Albania, now in the principality of Montenegro, on the Adriatic. It is built on an isolated hill forming a cape, which is united to the low land by an isthmus; it contains about 4000 inhabitants, and is the seat of a Roman Catholic bishop. The inhabitants, formerly notorious under the name of *Dulcignottes*, as the most dangerous pirates of the Adriatic, are now engaged in commerce or in the fisheries of the river Bojana, 6 or 7 miles south-east from the town.

DULCIMER, a musical instrument resembling, if not identical with, the psaltery or *nebel* of the Jews. The modern dulcimer consists of a small square, triangular, or trapeziform box about 4 feet long, containing the sounding-board, at the right and left of which are the screws for tuning. The strings are of wire, and there are two or three in unison for each tone. The compass embraces about three octaves. It is played with two little sticks having oval knobs at each end. When played *forte*, the sound is too confused to be pleasant, as there is no contrivance to stop the vibration of the strings, such as the dampers of the pianoforte. The instrument is now seldom met with except in the hands of street musicians.

DULCITE ($C_8H_8O_4$) is identical in composition with mannite, but differs from it in properties and in derivatives. It was obtained by Laurent in 1850 from an unknown sugary substance from Madagascar, which was in rounded lumps, but crystalline when broken through. By dissolving in water, filtering from impurities, and evaporating, the dulcite was deposited in large transparent, lustrous, modified monoclinic prisms. Dulcite has a specific gravity of 1.46. It has a slightly sweet taste, no odour, and no rotatory effect on light. It is soluble in water, very sparingly soluble in alcohol. It fuses about $360^\circ F.$; at a higher temperature it loses water and yields *dulcitol*, and at a still higher temperature is decomposed, giving off gases and a distillate with an acetic odour. Nitric acid converts it into mucic acid, not into saccharic acid; the fuming acid into a nitro-compound; strong sulphuric acid into dulcisulphuric acid. It does not ferment with yeast. Dulcite combines with metallic oxides; the compounds with the alkalies and alkaline earths are crystalline and soluble in water.

DULSE, the Scotch name applied to various species of reddish brown or rose-coloured *Alga* (*Rhodomenia palmata*, *Iridaea edulis*, &c.) It is consumed in considerable quantities throughout the northern countries of Europe and in the Grecian Archipelago. The pepper-dulse (*Laurentia pinnatifida*), distinguished for its pungent taste, and the young stalks of the sea tangle, were of old often eaten in Scotland.

DULUTH, a town of the United States, capital of St. Louis county, Minnesota, situated at the N.W. extremity of Lake Superior, 156 miles N.W. of St. Paul's. It is the terminus of several important railways; its excellent natural harbour has been deepened and extended; and large docks and other works have been recently constructed. Its situation at the head of the navigation of the great lakes affords a convenient outlet for a large wheat area, while in the neighbourhood there are deposits of iron, granite, freestone, &c. Pop. (1890), 53,115; (1900), 52,968.

DULWICH, a suburban portion of London, in Surrey, included in the parish of Camberwell, and forming one of the three one-member parliamentary divisions of the borough of Camberwell. It is noticeable chiefly on account of its college and schools (the former called the College of God's Gift), founded in 1819 by Edward Allen or Alleyn, a distinguished actor in the reigns of Elizabeth and James I. The old college buildings form three sides of a quadrangle, and the institution has attached a manor of 1400 acres. The members of the college were to be a master, warden, four fellows, six poor brethren, six sisters, twelve scholars, and thirty out-members, but latterly the constitution of this charitable foundation has been greatly modified. The original revenues were only £800, but now amount to £20,000. The Dulwich College schools are by far the most important branch of Alleyn's charity. The 'upper school' occupies three handsome blocks, standing apart from the college proper, and opened in 1870 at a cost of about £100,000. The 'lower school' is accommodated in new buildings in Townley Road. The upper school is now a great public school, with exhibitions to either Oxford or Cambridge. Dulwich College is celebrated for its fine collection of pictures, many of which were bequeathed by the founder; but the greater and more valuable portion of them were the bequest of Sir Francis Bourgeois, a landscape-painter of some eminence, who died in 1810. The collection includes paintings by Teniers, Wouvermans, Ouy, Claude, Paul Potter, Ruysdael, Vandyk, Rubens, Rembrandt, Poussin, Salvator Rosa, Caravaggio, Paul Veronese, Guido, Titian, and other great masters. A free school was founded at Dulwich in 1741 by James Allen, a master of the college, for the instruction of sixty boys and sixty girls. Pop. (1901), 10,246; of parl. div., 97,354.

DUMARSAIS, CESAR CHESNEAU, a philologist, was born in 1876, at Marseilles. He early lost his father, his fortune was dissipated by the extravagance of his mother, and a library which he inherited was sold. The idea of losing the latter so disturbed the boy, then but seven years old, that he concealed all the books of which he could possess himself. He became an advocate, married unhappily, kept a school, and died in misery, 1756. His merits were overlooked by his own age, and his best works remained for a long time unknown. D'Alembert aptly calls him the *La Fontaine* of philologists. De Gerando, in a prize dissertation presented to the French Institute in 1805, has justly appreciated the merit of this profound inquirer. His works were published at Paris, 1797, in seven volumes. The principal are, *A New Method of Teaching the Latin Language*; a *Treatise on Tropes*; the *Principles of (general) Grammar*; and his contributions to the *Encyclopedie*.

DUMAS, ALEXANDRE, one of the most popular and prolific of modern French dramatists and novelists, was born at Villers-Cotterets, 24th July, 1803. He was the son of a republican general who bore the same name, and grandson of Marquis de la Paillette and a negress, Tiennette Dumas. In 1807, on the death of his father, who left his family unprovided for, he was left in charge of his mother, who let him have pretty much of his own way. The consequence was that he picked up little education at school, and when he went to Paris at the age of twenty, to push his fortune, his beautiful handwriting was the only recommendation which General Foy, a friend of his father, could offer in his favour in introducing him to the notice of the Duke of Orleans. This nobleman (afterwards Louis Philippe) employed him as an assistant-secretary at 1200 francs a year. He now devoted his leisure hours to completing his education, and his ambition ceaselessly prompted him to shine in the field of literature. Some of his lighter dramatic

works were rejected by the theatrical directors, some were accepted, and had more or less success, bringing but little fame or profit to their author. At last (10th Feb. 1829) his drama of *Henri III.* appeared on the stage of the Comédie-Française. The third tier of the theatre was filled by the good-natured Duke of Orleans and his brilliant circle of friends, who led the applause. It was produced when the battle between the Romanticists and the Classicists was at its height, and hailed as a triumph by the former school. The piece became popular and brought the lucky dramatist the sum of 80,000 francs, and the post of librarian to the Duke of Orleans. The same year appeared his *Christine*, and in quick succession, *Antony*, *Richard d'Arlington*, *Térésa*, *Le Tour de Neale*, *Catherine Howard*, *Mlle. de Belle-Ile*, &c. Dumas had now become a noted Parisian character. The critics fought over the merits of his pieces, and the scandalmongers over his prodigality and *galanteries*. Turning his attention to romance, and desirous of becoming the Walter Scott of his country, he produced a series of historical romances, among which may be mentioned, *Les Deux Dianas*; *La Reine Margot*; *Les trois Mousquetaires*, which, with its continuations, occupies eight volumes. The *Comte de Monte-Cristo* and the *Mémoires d'un Médecin*, and one or two others, are also well known through translations to English readers. Several historical works also bear his name: *Louis XIV. et son Siècle*; *Le Regent et Louis XV.*; *Le Drame de '93*; *Florence et les Médicis*, &c. In 1852 he began the publication of his *Mémoires*, a curious autobiography, which presents interesting sketches of literary life during the restoration, but which soon disgusts the reader by the intense egotism displayed all through the work. He tried to acquire political importance through the publication of a daily newspaper, *La Liberté*, which was a miserable failure; then followed a monthly magazine, *Le Mois*, which was not more successful; this again was followed by *Le Mousquetaire*, subsequently called *Le Monte-Cristo*, which lived a good number of years, and in which he published his romances, translations, *Mémoires*, *Causeries*, &c. In 1846 he accompanied the Duke of Montpensier to Spain as the historiographer of his marriage; and some time afterwards a small steamer was put at his disposal for a voyage to Africa. On his return to Paris he opened a theatre for the purpose of producing only his own pieces; and built a fantastic and costly country seat, which was known as the *Château de Monte-Cristo*, and on which he expended 450,000 francs. In 1853 his extravagances had so reduced his means that he was compelled to retire to Belgium. Speedily recovering from pecuniary embarrassment he visited Russia, the Caucasus, Greece, and Turkey. In 1860 he accompanied Garibaldi in the expedition which freed Naples from the Bourbons, and contributed not a little, if we can take his own word for it, to the great liberator's success. He died at the residence of his son, at Puits, near Dieppe, on the 5th December, 1870.

It is difficult to come to a satisfactory conclusion as to the merits of this author. Some of his productions are little else than mere translations from English and German sources. His first drama, *Henri III.*, is but a skilful piece of patchwork, Walter Scott and Schiller furnishing him with the bulk of the material. Equally fatal to his reputation is our knowledge of the fact, gained from a lawsuit he had with the *Presse* and the *Constitutionnel* newspapers, and from a work by Mircourt, entitled, *Fabrique des Romans*, *Maison A. Dumas et Cie.* (Dumas & Co.'s Romance Factory), that he had arranged to supply those journals during the year with more novels than the most expert scribe could copy in the time, and that he had

in his pay numerous hacks who did the serious part of the work. The only claim he could lay to a great number of the productions issued under his name, was that he either sketched the plot or revised them before going to press. Yet of the talent and even genius of Dumas there can be no reasonable doubt; he had great fertility of invention, much humour and gaiety, and genuine dramatic power, as the works that were undoubtedly from his pen sufficiently testify; and it was not till he had secured a front rank in literature by his own exertions that he descended to the unworthy plan of employing assistants to manufacture novels to order. A number of his collaborateurs, such as Feuillet, De Nerval, Souvestre, and Meurice, have subsequently gained a good position in French contemporary literature.

His son, ALEXANDRE, was one of the cleverest and most successful of the modern French novelists and dramatists. The notorious novel, *La Dame aux Camélias* (The Lady with the Camélias—a courtesan of Paris), published in 1848, afterwards dramatized by himself, and on which Verdi's opera *Traviata* is founded, was his first notably successful fiction. Among his numerous plays are *Le Demi-monde*, *Monsieur Alphonse*, *Denise*, and *Le Fils Naturel*. He was born in 1824, and died 27th November, 1895.

DUMAS, MATTHIEU, born at Montpellier in 1758, early entered the French cavalry, and as adjutant to Rochambeau took part in the war of North American independence. After his return he obtained the rank of major, and was employed on several military missions in the Levant and in Holland. In 1788 he held an important appointment in the war office. At the commencement of the revolution he assisted Lafayette in organizing the national guard, in 1790, when Louis XVI. was brought back from Varennes to Paris, he was the superior officer in command, and in 1792 was appointed brigadier-general and commandant of Metz. As a member of the National Assembly he declared himself decidedly in favour of moderate measures, and thus made himself so obnoxious to the more violent demagogues that he was ultimately obliged to take refuge in Switzerland. Here he relieved the tedium of exile by commencing the historical work which was afterwards published, and gives him an honourable place among military writers. On the establishment of the directory he returned to France, and was elected by the department of Seine and Oise a member of the Council of Ancients, where he joined the party of Portalis, Dupont de Nemours, Carnot, and others. Most of the party ultimately perished in the tropical swamps to which they were transported; Dumas escaped almost by miracle, and found an asylum at Hamburg. Here he published the two first volumes of his *Précis des Evénemens Militaires*. He was recalled from exile by Napoleon, who had become first consul. His first employment was to organize the reserve for the army of Italy. In 1802 he was appointed state councillor, in which capacity he was employed in many important affairs, and took the lead in the tribunate and legislative body in the discussions relative to the creation of the Legion of Honour; in 1805 he became general of division, and was shortly afterwards Neapolitan minister in the service of Joseph Bonaparte, who made him grand-marshal of the palace. In 1808 he returned to France, was actively employed in the arrangements for the war against Austria, fought in the battles of Essling and Wagram, and arranged the terms of the armistice of Znaim. He held the office of general intendant of the army in the campaign of 1812, as well as in that of 1813, when he concluded the capitulation of Dresden. Prince Schwartzemberg, however, refused to ratify its terms, and Dumas, made prisoner, was carried off to Hungary. On his return

in 1814, after the restoration, Louis XVIII. appointed him councillor of state, gave him several important appointments connected with the army, and in 1815 sent him to Metz, where his duty was to prevent the guard from going over to Napoleon. During the Hundred Days his only employment was in organizing the national guards. After the second restoration Dumas was first employed in the war department in 1818, and was again admitted to the council of state; but having joined the opposition in the chamber of deputies, was deprived of all his appointments. In 1830 he was one of the 221 deputies who signed the address which paved the way for the revolution of July. After the fall of Charles X. he once more, in concert with Lafayette, organized the national guard of Paris, and obtained the chief command of all the national guards of France, together with a peerage. Latterly he became almost blind, and died in 1837. His military work above referred to, embracing the ten years from the Congress of Rastadt in 1797 to the Peace of Tilsit in 1807, extends to nineteen vols., and is regarded as high authority. He also published a translation of Napier's History of the Peninsular War, with notes, and left behind him materials for a work which was published by his son under the title of *Souvenirs de M. Dumas*.

DUMBARTON (formerly *Lennox*, or *Levenia*), a maritime county, Scotland, consisting of two detached portions, the larger and most westerly having the county of Perth on the north, Loch Lomond and the county of Stirling on the east, the Clyde separating it from the county of Renfrew on the south, and Loch Long separating it from the county of Argyll on the west. Its utmost length is about 37 miles, breadth varying from 5 to 7 miles, and in some places, towards its northern extremity, diminishing to 1 and 1½ mile. The smaller portion is about 4 miles east from the former, and comprises the two parishes of Cumbernauld and Kirkintilloch. It is about 14 miles long, and from 1½ to 3½ miles broad, having the county of Stirling on the north and east, and the county of Lanark on the south and west. These two parishes formerly belonged to the county of Stirling, but were annexed to that of Dumbarton in the reign of Robert I. More than half the area of the county is occupied by lofty and rugged mountains, some of them attaining a height of upwards of 3000 feet above sea level. Though unfit for cultivation, and covered with snow for several months in the year, they abound in excellent pasture for sheep, and produce many rare alpine plants. The lower lands are fertile, and in general well cultivated. Next to its mountains, which contribute to the formation of some of the most magnificent scenery in Scotland, are, as regards picturesque beauty, its lakes, of which the principal is the far-famed Loch-Lomond, which separates it for about 24 miles from Stirlingshire. The most considerable of the other fresh-water lakes, of which there are nine or ten, is Loch Sloy. The Gareloch, an arm of the sea lying parallel to Loch Long, forms a part of the county into the Roseneath peninsula. The principal river is the Leven, which issues from Loch Lomond, and discharges itself into the Clyde a little below the town of Dumbarton. The state of agriculture in this county is as various as its soil and surface. The farms in general are small, except where the heath and mountains are used as sheep pasture. Wheat is now raised to a considerable extent, but oats are the principal grain crop. Turnips, beans, and potatoes are also grown, the last in large quantities and of superior quality. The climate is in general mild, but extremely moist, and is thus more favourable to pasturage and the growth of wood than to agriculture. There are extensive natural copse-

DUMBARTON—DUMFRIES.

woods in the county, which add much to the beauty of the scenery, and large plantations of wood have been planted during the last half century. The chief minerals are coal, limestone, ironstone, and slate, all of which are wrought more or less—the first two to a great extent, at Old Kilpatrick, Kirkintilloch, and Cumbernauld. On the banks of the Leven and elsewhere are several extensive cotton printing, dyeing, and bleaching establishments. Helensburgh and Loch Lomond are connected by railway with Glasgow, and another line runs from the loch to Stirling. The detached part of the county is traversed by the lines belonging to the North British and Caledonian Railway Companies, and by the Clyde and Forth Canal, which has its west termination at Bowling. Besides Dumbarton, the chief town, the county contains the towns of Helensburgh, Kirkintilloch, Alexandria, Renton, and Bonhill, some of them with active manufactures. The county returns one member to the House of Commons. Pop. (1881), 75,393; (1891), 98,030; (1901), 113,870.

DUMBARTON, a royal and parliamentary burgh and seaport, Scotland, chief town of above county, on the left bank of the Leven, within a short distance of its junction with the Clyde, 13 miles W.N.W. Glasgow, on a branch of the North British Railway. The principal street is semicircular, and from it many other streets diverge. The houses on the line of the main street are in general well built, but in some of the subordinate streets and lanes there are houses antiquated and mean-looking; great improvements have, however, recently been carried out, and many new houses built. On the right bank of the river is the suburb of West Bridgend (now included within the parliamentary burgh), united with the town by a good stone bridge of five arches. The chief public buildings are the burgh hall, built in 1866, and containing rooms for the academy, and the county buildings. There are a mechanics' institute, a public reading-room, and a free library. Ship-building is the staple business of the town, there being in all six spacious yards, employing about 4000 men. This branch of industry, as on the Clyde generally, has made great advances in recent years. Two marine-engine manufactories are also carried on, employing about 1000 men. Besides these there are a brewery, several foundries, an extensive forge, a manufactory of patent windlasses, engines, saw-mills, &c. The Leven is navigable to Dumbarton quay, at high water, for vessels of considerable size; but the channel, though it has been much improved, is still somewhat obstructed by sandbanks. Steps have, however, been taken to have these obstructions entirely removed by dredging.

A little to the south of the town is the famous rock and castle of Dumbarton, situated on a flat point of land at the confluence of the Leven with the Clyde, now accessible at all times by land, although formerly surrounded by water. The rock terminates at the summit in two points, and, being precipitous and entirely isolated, has a very striking appearance. It is 206 feet in height, and about 1 mile in circumference at the base. On the side facing the river, looking south, stands the house once occupied by the governor; and between the two summits are the various buildings of the fort, consisting of the barracks, armoury, &c., the former capable of accommodating 150 men. The double-handed sword, said (doubtfully) to have belonged to Wallace, has lately been removed to the Wallace monument, Stirling. A long flight of steps leads to the barracks, &c., which are not accessible otherwise. At what period a castle was first erected does not appear, but it seems to have been a stronghold from the earliest times, and is known to have been so for at least 1000 years. It was at

different times in possession of Edward I. It came subsequently and successively into the possession of Balliol, Bruce, Queen Mary, Charles I., and Cromwell. It was from this castle that the unfortunate queen just named was conveyed to France while yet a child. In 1568 she visited this fortress with a numerous retinue on a progress to Argyleshire. Dumbarton Castle was the scene also of a singularly daring adventure. In May, 1571, it was taken by escalade, on a dark and stormy night, by Captain Thomas Crawford and a few soldiers, under circumstances demanding an extraordinary degree of intrepidity. This fortress is one of the four stipulated to be kept in repair by the articles of the Union. Dumbarton was known in ancient times by the name of Alclud, which, in the British language, signifies the rock on the Clyde. It unites with Port-Glasgow, Renfrew, Rutherglen, and Kilmarnock in sending a member to the House of Commons. Pop. in 1881, 14,172; in 1891, 16,908; in 1901, 19,864.

DUMDUM, a town, municipality, and cantonment in Hindustan, in the province of Bengal, 4½ miles S.W. Calcutta. It has commodious barracks built of brick, contains an English school, and has a station on the Eastern Bengal Railway. It was the headquarters of the Bengal Artillery from 1788 until they were removed to the more central station of Meerut in 1853. The town is famous as being the scene of the first open manifestation of the Sepoys against the greased cartridges, which led to the outbreak of the mutiny of 1857. Pop. in 1891 (including the military), 11,000.

DUMFRIES, a maritime county, Scotland, on the Solway Firth, having on the north and east the counties of Lanark, Peebles, Selkirk, and Roxburgh; on the west, Ayr and Kirkcudbright; on the south, the Solway Firth and part of Cumberland; length, north-west to south-east, 53 miles; breadth, between 32 miles and 33 miles, area, 1098 square miles, or 702,953 acres, of which about a third is under cultivation. The surface is irregular, but for the most part mountainous, especially in the north and north-west districts, where the hills attain a considerable elevation, some of them exceeding 2000 feet. Lofty mountains occur also at intervals throughout the whole length of the northern limit of the county, including Hartfell, the highest in the south of Scotland, 2790 feet in height, and Ettrick Pen, about 8 miles south-east of the former, 2220 feet. These parts of the county abound in the most romantic scenery. In the lower, or southern portions, there are some extensive morasses, one of which, called Locher Moss, is from 10 to 13 miles long and from 2 to 3 miles broad. In these swamps large trunks of trees, marine shells, ancient canoes, and iron anchors have been found at great depths in the moss. Arable husbandry has greatly improved here during the last half century, as have also farm buildings of all descriptions. They are now mostly commodious and well arranged, built of stone and lime, and covered with slate. Oats, potatoes, and turnips are the most common products. The cultivation of the last has increased greatly of late years; they are generally consumed on the ground by sheep. The cattle are mostly of the Galloway breed, and are much in request for the English market. The sheep on the hill pastures are mostly Cheviots; on the lower and arable lands the Leicester prevails. Immense numbers of pigs are reared in the county, hams and bacon, both of excellent quality, being cured in large quantities for the Liverpool, London, and Newcastle markets. The farms in the lower districts vary from 100 to 400 acres, and in the higher from 500 to 5000 acres. The principal streams are the Nith, the Annan, and the Esk, all falling into the Solway Firth, which in fact receives

the whole of the drainage of the county. There are likewise a number of small lakes. The chief minerals of economic importance are coal, lead, limestone, and sandstone. Coal is worked at Canonbie and at Sanquhar, and lead-mines at Wanlockhead and Leadhills. The Wanlock ore contains a considerable proportion of silver. Limestone and freestone abound in various parts of the county, and the latter in particular is largely quarried and sent to various parts of the country. Gold also has been found amongst the mountains; and in the time of James V. considerable quantities were obtained. The county returns one member to the House of Commons. The county town is Dumfries, with which Annan, Sanquhar, Lochmaben, and Kirkcudbright (the last in Kirkcudbrightshire)—the Dumfries burghs—unite in sending a member to Parliament. Other Dumfriesshire towns are Moffat, Langholm, and Lockerbie. Pop. in 1881, 76,140; in 1891, 74,382; in 1901, 72,569.

DUMFRIES, a river port and parliamentary burgh of Scotland, capital of the above county, beautifully situated on the left bank of the Nith, about 6 miles from its junction with the Solway Firth, 64 miles s.w. of Edinburgh, a station on the Glasgow and South-western Railway. The houses are chiefly built of red sandstone, and are generally remarkable for their elegance. On the opposite side of the river is an extensive suburb called Maxwelltown, which communicates with the town by an old and a handsome modern bridge, together with a suspension bridge for pedestrians. The public buildings comprise the trades' hall, county buildings, including the court-houses and county jail; the assembly-rooms, theatre, academy, free library; the Orlinton Royal Institution or lunatic asylum; the infirmary, and the savings-bank, in front of which is a statue of the Rev. Dr. Duncan, the originator of savings-banks. Near the centre of the town is the old town-house, of which Inigo Jones is said to have built the mid-steeple, and in the centre of Queensberry Square there is a stately Doric column erected to the memory of Charles, duke of Queensberry. There are two important iron-foundries, several hosiery and tweed factories, tanneries, coachbuilding works, &c. The river Nith is navigable to the town for vessels drawing about 8 feet of water. There are stations lower down the Nith for vessels drawing too much water to come up to the town. When the town became an important railway centre the shipping trade diminished for a time, but it is again reviving. Dumfries is of great antiquity, and has been the scene of some remarkable historical events; one of which was the slaughter of John Comyn by Robert Bruce, which occurred in the chapel of the Franciscan or Grayfriars' convent that stood in the Friars' Vennel, on February 10, 1306. In the burying-ground of St. Michael's are deposited the remains of the poet Burns, who died in Dumfries, and whose resting-place is marked by a handsome mausoleum. Burns resided in Dumfries for some years preceding his death, and the street in which he lived now bears his name. A statue of the poet was erected in front of Grayfriars' Church in 1882. Dumfries unites with Annan, Sanquhar, Lochmaben, and Kirkcudbright in sending a member to Parliament. Pop. in 1881, 17,092; in 1891, 17,821; in 1901, 17,081.

DUMONT, PIERRE ETIENNE LOUIS, the friend and literary assistant of Mirabeau and Jeremy Bentham, was born at Geneva on July 18, 1759. He was destined for an ecclesiastical career, and was ordained a minister of the Protestant church in 1781. He attached himself to the Democratic party in Geneva, and when the opposite party gained the ascendancy he went to St. Petersburg in 1782, where he was appointed pastor of the French Reformed Church.

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His talents for the pulpit caused his acquaintance to be sought by the eminent men, Russians and strangers, who were at the court of Catherine II. He had remained there but eighteen months when Lord Lansdowne invited him to England, with the intention of employing him to finish the education of his son. It was in the house of this statesman that he formed intimate connections with Jeremy Bentham and Sir Samuel Romilly. The French revolution brought him to Paris in the year 1789. He was soon called to associate himself with the men who at this time became prominent in directing the destinies of France. It is asserted that the famous address to the king, proposed by Mirabeau, July 9, 1789, to obtain the sending back of the troops, was composed by Dumont. They undertook together a journal, the *Courier des Provinces*, designed to develop and render popular the new doctrines; and, as was likely to happen in such a partnership, the most assiduous as well as the most important labour fell upon Dumont. As soon as scenes of violence and cruelty began to sully the cause of liberty Dumont quitted Paris and returned to England. When the details of the reign of terror reached him in England he was overcome with grief, and remained for some years plunged in sadness. What contributed the most to draw him from this state of depression was his increased intimacy with Jeremy Bentham, whom he had known since 1788. The enthusiasm of Dumont for Bentham was kept up, without deviation or division, to the end of his life. He sometimes said of what he most admired in other philosophers, 'It is convincing; it is truth itself; it is almost Benthamism'. It is well known that M. Dumont edited many of the works of this distinguished jurist, after divesting the ideas of the uncouth garb in which the author had clothed them. (See BENTHAM.) Dumont has spoken of the manuscripts which his friend put into his hands as a 'first draft', 'unfinished manuscripts', 'not corrected', 'fragments or simple notes'. This was pointing out but a small part of their imperfections, and so much was done by Dumont to some of these works that not only the arrangement and line of argumentation, but sometimes even the results were altered. Suppressing much, sometimes adding, always making more perfect, he finally produced a system which has powerfully excited thought and reflection all over Europe. When Geneva recovered her independence in 1814 M. Dumont hastened back to his country, where his attempts to introduce liberal principles into the constitution of this little state exposed him to much political persecution; but he succeeded, eventually, in effecting some important improvements. He afterwards laboured assiduously to introduce an improved penal code, and was a member of a committee appointed in May, 1817, for this purpose. He was also active in getting up a penitentiary, for which he drew up a plan in 1824. He died at Milan on September 29, 1829.

DUMONT D'URVILLE, JULES SEBASTIEN CESAR, a celebrated French navigator, was born in 1790 at Condé-sur-Noireau, in the department of Calvados. After completing his studies at Caen he entered the navy, in which he ultimately rose to be vice-admiral. In 1819-20 he sailed in the expedition under Gaultier Daparn to the coasts of the Archipelago and the Black Sea. In 1822 he sailed with Captain Duperry in the corvette *La Coquille*, and made his first voyage round the world. On a second voyage in the *Astrolabe* (1826-29), and a third in the *Zélée* in 1834, he held the command. He was twice wrecked in the course of these distant voyages, first on the Tonga Islands, and next in Torres' Straits, and on both occasions he owed his escape chiefly to self-possession and skilful seamanship. In 1880 the government of July intrusted him with the ship which carried Charles X. from

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Cherbourg to England. He afterwards rendered important service by his search for the remains of the ill-fated expedition of La Pérouse, the survey of long tracts of coast in New Zealand and New Guinea, the discovery of numerous islands and an antarctic continent, and the exploration of very dangerous and still imperfectly known tracts of navigation, as Torres' Straits, in Australia, and Cook's Straits, between the two large islands of New Zealand. To his contributions to geography he was indebted for his nomination to the office of president of the Paris Geographical Society. One fruit of his voyages was the *Enumeratio Plantarum in Insulis Archipelagi et Littoribus Ponti Euxini* (Paris, 1822). After his second circumnavigation, he published the *Voyage de l'Astrolabe* (ten vols. Paris, 1830-39), and *Voyage Pittoresque autour du Monde* (two vols. 1834). He had also the chief part in drawing up the new voyages of the *Astrolabe* and *Zélée*. His death was very tragical. After escaping all the dangers of the sea, he was burned alive, along with his wife and son, in the frightful accident which took place on the Paris and Versailles Railway, 8th May, 1842. Monuments have been erected to him in his native town, and in the cemetery of Montparnasse at Paris.

DUMOURIEZ, CHARLES FRANÇOIS DUPERRIER, a French general of great military talent, was born at Cambrai in 1739, of a noble family of Provence. He joined the army in Germany in 1757, and was appointed a commissary. He then served as a cornet in the regiment of Escars. The day before the battle of Clostercamp he was wounded and taken prisoner; in 1761 was made a captain; dismissed in 1763, and presented with the cross of St. Louis. He afterwards visited Corsica, Spain, and Portugal. The conquest of Corsica, which had been ceded to France by Genoa in 1768, being determined upon, Dumouriez went as quarter-master-general of the small army which was sent thither, and was afterwards made colonel. In 1770 the government gave him the commission to oppose the measures of the Russian court at the confederation of Bar. He took part in the campaign of 1771 against the Russians. In 1773 he was sent by the king on a mission to Sweden, but was arrested at Hamburg by D'Aiguillon, to whom the mission was not agreeable, and put in the Bastille. In 1788 he was appointed brigadier. In 1789 he published a pamphlet in favour of the principles then in vogue, but failed in obtaining, as he wished, the rank of general. He therefore returned to Cherbourg, where he was made commander of the national guard in that city, and governor of Lower Normandy. At the end of the year he again returned to the capital, where he became a member of the Jacobin club. About this time he was made field-marshal of the twelfth division of the army; but, being dissatisfied with a post where he had little opportunity to distinguish himself, he remained in the capital, and courted more than ever the Jacobin party. After leaving the ministry, in which he had been placed for some time, he was made lieutenant-general in the army of Luckner, on the northern frontier, and was invested with the command of the army of the centre after the departure of Lafayette (Aug. 19). The Prussians, Austrians, and united emigrants, had then made themselves masters of Longwy and Verdun, and were advancing upon Champagne. He took his position at Grandpré, and occupied the five passes of the woody heights of Argonne; but when the pass of Croix aux Bois was forced by the Austrians, he retired to St. Ménauld, while Kellerman maintained his position at Valmy (September 20, 1792), and then opened a negotiation with the King of Prussia. In October he returned to Paris, and formed a plan with the executive council for the winter cam-

paign. On his return to the army he issued a proclamation, calling upon the Belgians to rise against their sovereign, and, November 6, assaulted the Austrian camp at Jemappes. Notwithstanding their small numbers, the imperial troops did not yield till after a long and bloody battle. Dumouriez then took up his winter-quarters on the Meuse and the Roer. February 15 he opened the campaign with the bombardment of Maestricht, and from Breda and Clundert, both which places he had captured, he made his attack on Holland. The greatest part of his troops, however, whom he had scattered in winter-quarters, were in no condition to meet the Prince of Coburg. This general, March 1, assaulted the French outposts on the Roer, overcame them, and threatened Maestricht. Dumouriez now drew together his troops to the plains of Tirlemont, gave battle to the Austrians at Neerwinden, and was defeated. He met with another loss at Louvain, and found himself obliged to retreat.

These disasters were the signal for his downfall. On his arrival at the French frontiers four commissioners and the minister Bourdonville, who were sent to arrest him, were delivered by him into the hands of the Austrians. He then issued a proclamation, in which he promised the restoration of the constitutional monarchy, in the person of the heir to the crown, but was attacked by the Versailles volunteers, compelled to cross the Scheldt, and to flee to the Prince of Coburg (April 4, 1793). The convention set a price of 300,000 livres upon his head. At first he retired to Brussels, afterwards to Cologne. The elector refusing him a residence in Mergentheim, he went to Switzerland, and in July passed over to England, which, however, he was compelled to quit; he then roved through Switzerland and Germany, and after staying for a time near Hamburg, where he published his *Memoirs*, found a final refuge in England. There was no party, except that of the Mountain, for which this political Proteus did not declare himself, in some of the various pamphlets that he published during his exile. Shortly after the battle of Eylau he wrote his *Jugement sur Bonaparte, adressé à la Nation Française et à l'Europe*. During the Spanish and Portuguese war he was very active in communicating plans to the British government, and to the Spanish and Portuguese authorities. The British ministry granted him an annual pension of £1200. He died, March 14, 1823, at Turville Park, near Henley-upon-Thames, England, at the age of eighty-four.

DŪN, a Celtic word meaning fort, fortified height, hill, common in place-names, and giving rise to the final syllable *-dunum* in the Latinized forms of place-names in Gaul, as *Augustodunum* (Autun). It appears in many names in Scotland and Ireland, as in *Dunblane, Dundee, Dundalk, Dunboyne*, &c.; and is sometimes changed to *dum*, as in *Dumbarton*. It is not the same word as *A. Sax. dān, E. down*, Dutch *dwin*, hill, sand-hill, which is seen in *Dunkirk*.

DUNA, or WESTERN DVINA, a river of Russia, rises in the government of Tver, about 15 miles w. of the source of the Volga, flows first circuitously, s.e.w., through that government, and along the frontiers of the governments of Pskov, Smolensk, and Vitebsk, till it reaches the town of Vitebsk, when it turns gradually round, assumes a w.e.w. direction, separating Vitebsk and Livonia, on its right, from Mitak and Courland on its left, and finally falls into the gulf, about 10 miles below the town of Riga, after a course of about 650 miles. In spring it is navigable nearly to its source, but at other times not beyond Willis. It continues frozen from the end of November to the beginning of April, and has several rapids, which become dangerous when the

water is low. It is connected with the Volga and the Dniaper by means of canals. It is subject to inundations, particularly at the melting of the ice, and frequently commits great ravages. It abounds with fish.

DUNABURG, or **DVINSK**, a fortified town of Russia, government of Vitebsk, on the right bank of the Dvina, or *Dvina*, 112 miles south-east from Riga. It was formerly the capital of Polish Livonia, and has two Roman Catholic churches, a synagogue, and a convent. It is of great military importance, and carries on a considerable trade. Pop. (1897), 72,231.

DUNBAR, a royal and municipal (formerly parl.) burgh and seaport town in Haddingtonshire, situated on a gentle acclivity at the mouth of the Firth of Forth, 27 miles east of Edinburgh. It consists, chiefly, of one principal street running east and west, with some smaller streets and a number of lanes. It is a place of great antiquity, and originated in a castle, once of great strength and importance as a bulwark against the invasions of the English. The castle underwent several memorable sieges, the most memorable of which was that by the Earl of Salisbury, when it was successfully defended for nineteen weeks by Black Agnes, countess of Dunbar. The castle was destroyed by order of Parliament in 1567. In 1650 Cromwell totally defeated the Scottish army under David Leslie near the town. The harbour and quay of Dunbar are rather inconvenient, and the usual depth of water is scarcely sufficient to float vessels of 300 tons burden. With the exception of some trade in corn, malt, and potatoes, almost the only traffic carried on by sea here is connected with the catching, curing, and selling of fish, particularly herring. In the town there is also a brewery. Dunbar is growing in favour as a seaside resort, and has fine esplanades, villas, large hotels, &c. Up till 1885 the town united with North Berwick, Jedburgh, Haddington, and Lauder in sending a member to Parliament. Pop. (1891), 3545; (1901), 3581.

DUNBAR, WILLIAM, the most eminent of all the old Scottish poets, was born, probably in East Lothian, about the middle of the fifteenth century. In 1475 he went to St. Andrews, where, in 1477, he took the degree of B.A., and two years later that of M.A. After this time he seems to have become a travelling novice of the Franciscan order, travelling in England and France, but he returned to Scotland in 1490, and attached himself to the court of James IV, from whom he received a small pension. It has also been inferred from several allusions in his poems that he had passed some considerable time on the Continent in the king's service, probably as 'clerk' or secretary to some of the Scottish ambassadors. On the marriage of James IV. to Margaret of England, Dunbar celebrated that event, so auspicious of the happiness of his country, in a poem of singular beauty, entitled, *The Thrusil and the Rois*, in which he emblemized the junction and amity of the two portions of Britain. He seems to have afterwards been on good terms with the queen, for he addresses several poems in a very familiar style to her majesty. Notwithstanding, however, his great merit as a poet, he seems to have lived a life of poverty, with perhaps no regular means of subsistence but his pension. He appears to have addressed both the king and the queen for a benefice, but always without success. How it came to pass that King James, who was so kind a patron to men possessing powers of amusement, neglected to provide for Dunbar, is not to be

for. Next to the *Thrusil* and the *Rois*, the most considerable poem by Dunbar was the *Goldyn Targe*, a moral allegorical piece, intended to demonstrate the general ascendancy of love over reason: the golden targe, or shield of reason, he shows

to be an insufficient protection to the shafts of Cupid. He is also supposed to be the author of an exquisitely humorous tale, entitled, *The Frieris of Berwick*, which has supplied the groundwork of a well-known poem of Allan Ramsay, designated *The Monk and the Miller's Wife*. Another composition, styled the *Twa Maryit Women and the Wedo*, contains much humorous sentiment and many sarcastic reflections upon the fair sex. The poem entitled *A Dance*, presents pictures of the seven deadly sins, equally expressive, perhaps, with any that could have been delineated by Milton himself. The date of his death is uncertain. It is supposed to have occurred between 1520 and 1530. He had the fortune, rare in that age, of seeing some of his works printed in his own lifetime. In 1508, among the very first efforts of the Scottish press, Chepman and Myllar published his *Goldyn Targe*, his *Twa Maryit Women and the Wedo*, and several other poems. The remainder have only reached us in manuscripts. An edition of his poems, with life and notes, by Dr. David Laing, was published at Edinburgh in 1834; more recent is that by Dr. John Small (Scottish Text Society, 1884).

DUNBLANE, a police burgh and an old episcopal city, Scotland, in the county of Perth, 6 miles north-east of Stirling, on the Allan, and a station on the Caledonian Railway. The most remarkable object is an ancient cathedral, recently restored, with a tower, situated on an eminence overlooking the town. The date of its erection is supposed to have been in the twelfth century. The nave is 130 feet by 58 feet, and the choir, now the parish church, is 80 feet by 30 feet. Bishop Leighton, who held the see from 1662 to 1670, bequeathed his library to the clergy of the diocese, his executors providing a suitable building for its reception, and endowing the establishment with funds to defray the librarian's salary, uphold the fabric, and add to the books. The public have access to the library, which has received large accessions. A hydropathic establishment was opened in 1876. About two miles from the town the indecisive battle of Sheriffmuir was fought in 1715, between the royal forces under the Duke of Argyle, and the Jacobites under the Earl of Mar. Pop. in 1891, 2186; in 1901, 2516.

DUNCAN, ADAM, VISCOUNT, a naval officer of distinguished skill and courage, was born in Dundee in 1731. He went to sea when young, obtained a lieutenancy in 1755, was made master and commander in 1759, and was a post-captain in 1761. In that station he served, in the following year, at the taking of Havana; and in 1779 he shared in the victory of Admiral Rodney over the Spaniards. In 1789 he was promoted to the rank of rear-admiral of the blue; and by regular gradation, in 1794 he became vice-admiral of the white squadron. The following year he was appointed commander of the North Sea fleet; when, after a tedious and harassing service of two years, occupied in watching the motions of the Dutch in the harbour of the Texel, Admiral Duncan found himself obliged to leave his station and sail to Yarmouth Roads, in consequence of the mutinous disposition of his sailors. The Dutch fleet put to sea, which was no sooner made known to Admiral Duncan's men than they returned to their duty, and he immediately sailed in pursuit of the enemy, came up with them near Camperdown, defeated them, and captured the commander, Admiral De Winter, and eight of his ships, 11th Oct. 1797. The conqueror was rewarded with the title of Viscount Duncan and a pension of £2000 a year. He died August 4, 1804.

DUNOAN, THOMAS, an eminent Scottish painter, was born at Kinclaven, Perthshire, on 24th May, 1807. He studied art under Sir William Allan, began to exhibit at the Scottish Academy in 1828, and became

as a mountaineer in 1830. The first picture which extended his fame beyond the Tweed, and helped to procure his admission as an associate of the Royal Academy (1843), was Prince Charles Edward and the Highlanders entering Edinburgh after the Battle of Prestonpans (1840). Another famous picture of his is Charles Edward asleep after Culloden, protected by Flora Macdonald. His last exhibited work was the Martyrdom of John Brown of Priesthill, now in the Corporation Gallery of Glasgow. He also executed many portraits. He died at Edinburgh on 25th May, 1845.

DUNCANSBY HEAD, a picturesque promontory, forming the north-eastern extremity of Scotland, in the county of Caithness. It consists of a circular rocky eminence of about 2 miles in circumference, and is intersected by large ravines and remarkable fissures. About $1\frac{1}{2}$ mile west stood the celebrated John O'Groats' House, of which no trace now remains, but there is a hotel instead.

DUNDALK, a maritime town and formerly par. borough, Ireland, capital of the county of Louth, on Castletown River, where it suddenly expands to half a mile in width, about 2 miles above its mouth in Dundalk Bay. It is an ancient place, and in a battle fought in its vicinity Edward Bruce, the brother of King Robert Bruce of Scotland, was slain. It contains among its edifices several Roman Catholic and other churches, a number of schools, a court-house with a Doric portico, a guild-hall, cavalry barracks, and a nunnery. It manufactures ropes and castings, and the trade, chiefly in cattle and agricultural produce, is extensive. Pop. in 1881, 11,974; in 1891, 12,449; in 1901, 13,067.

DUNDAS OF ARNISTON, the name of a family which has long held a conspicuous place in Scotland.—**SIR JAMES DUNDAS**, the first of Arniston, who was knighted by James VI. and who was made governor of Berwick, was the third son of George Dundas of Dundas, a descendant of the Dunbars, earls of March.—His eldest son, **SIR JAMES**, was knighted by Charles I., was member of Parliament for Mid-Lothian, and was appointed one of the judges of the Court of Session (1662). He was soon after deprived of this appointment for refusing to abjure the solemn league and covenant, and retired to his family seat at Arniston, where he died in 1679.—His eldest son, **ROBERT**, was also raised to the bench of the Court of Session by William III., and filled that station with great honour and integrity for thirty-seven years. He died in 1727.—His eldest son, **ROBERT**, was born in 1685, became a member of the faculty of advocates in 1709, and in 1717, while the country was recovering from the confusion consequent upon the rebellion of 1715, he was selected to fill the responsible office of solicitor-general for Scotland. In 1720 he was made lord-advocate; and in 1722 was returned member to the British Parliament for the county of Edinburgh. When Sir R. Walpole and the Argyll party came into power, in 1725, he resigned his office, and soon after was elected dean of the faculty of advocates. In 1737 he was raised to the bench, taking, like his father and grandfather, the title Lord Arniston. On the death of Lord-president Forbes of Culloden, in 1748, he was appointed his successor. He died in 1753. His son Henry was the first Viscount Melville. (See below.)—His eldest son, **ROBERT**, born in 1713, studied at Edinburgh and Utrecht. He returned to Scotland in 1737, became a member of the faculty of advocates, and at the early age of twenty-nine was appointed solicitor-general for Scotland. In 1754 he was member for the county of Edinburgh, and the following year was appointed lord-advocate. In 1760 he became lord-president of the Court of Session, a situation which he held until his death in 1787.

DUNDAS, HENRY, VISCOUNT MELVILLE, a distinguished Scottish statesman, was born in 1742, and was a son of the second Robert Dundas mentioned above. He studied at the University of Edinburgh, in 1763 was admitted a member of the faculty of advocates, and in 1766 was appointed solicitor-general for Scotland, while from 1775 to 1788 he was lord-advocate. In Parliament he represented the county, and subsequently the city of Edinburgh. In 1782 he was appointed treasurer of the navy and made a member of the privy-council; but he continued only a short time in office, the coalition between North and Fox having displaced his party. He soon resumed his office under Pitt, whose firm friend and partisan he approved himself. In 1784, on the passing of the act for regulating the affairs of the East India Company, Dundas became a member of the board of control. In 1791 he was made home secretary, and in 1794 he became secretary at war. On Pitt's resignation in 1801 he ceased to be war secretary, but he supported Addington, and was created Viscount Melville in 1802. In 1804 he was appointed first lord of the admiralty under Pitt. Next year he was impeached, before the House of Lords, 'of high crimes and misdemeanours' in his former office of treasurer of the navy. As the evidence adduced against him did not directly implicate him in the malversation proved against his deputy, he was acquitted. He did not, however, hold any office afterwards. He was long practically the manager of Scottish affairs, and also of those of India. His death took place in May, 1811. Edinburgh contains two public monuments to Lord Melville's memory—one, a marble statue, by Chantrey, in the Parliament House; the other a column, surmounted by a statue, in St. Andrew's Square.

DUNDEE, a city, county, royal and parliamentary burgh and seaport of Scotland, in the county of Forfar, finely situated on the north bank of the Tay, about 10 miles from the open sea, 37 miles N.W. of Edinburgh. It stretches along the Tay for a distance of nearly 5 miles from east to west, the suburbs having been greatly extended of late years in both directions by the erection of numerous mansions and villas, which on the east are approaching Broughty Ferry. Its appearance from the opposite shore, from which its distance is $1\frac{1}{2}$ to 2 miles, is at once striking and pleasant. Hills rise in successive and diversified undulations immediately behind the town, the Law and Balgay Hill being prominent in the middle distance. The former stands in bold relief to the north, and attains a height of 570 feet; the latter, running down to the west with a more gradual slope, is well wooded, and has been acquired as a public park, part of it being tastefully laid out as a cemetery. In the centre of the town is a large open market-place, surrounded by substantial old-fashioned freestone buildings of four stories, and measuring about 760 by 100 feet. It is really a widening of the principal thoroughfare, called here the High Street, and successively, as it goes westward, Nethergate, and Perth Road. Although the houses and public buildings in this street are of no great architectural merit, yet its width, its curve, its slight upward westerly slope, and the irregularities both of frontage and of sky-line that prevail, give it a most picturesque appearance. The other streets are either old, narrow, and irregular, or modern, broad, and uniformly uninteresting. On approaching Dundee from the south or east the most conspicuous buildings are the old Tower of St. Mary's (the Parish) Church, and the Episcopal Church spire. The former, 156 feet high, is the only remnant of the original church, erected in the fifteenth century. This church was divided after the Reformation into three Presbyterian places of

worship, and was nearly all destroyed by fire in 1841. The building, still consisting of three distinct churches, was re-erected from plans by Bryce, and although of mixed and moderate architectural pretensions, has a striking general effect. The Episcopal Church spire is a fine specimen of Sir George Gilbert Scott's work, and stands with its church on the old Castle hill, which is now covered and surrounded by buildings. Amongst the other public buildings are several good specimens of early nineteenth-century classical work, of which the court-house and the High School in severe Doric are perhaps the finest; the Custom House and the Assembly Rooms being more formally adapted to modern needs. The Town-hall, a quaint and well-proportioned building of a bygone style, is a fine example of the architecture of the elder Adam, dating from 1784. Duthope Castle, on the south-west slope of the Law, was once the property of Claverhouse. Having, with the ground around it, been recently acquired for the city, the building is used for evening classes, and a public park has been laid out. Spanning the Cowgate is an old arch from which Wishart preached. The Albert Institute, designed by Sir G. Gilbert Scott, affords accommodation for Free Libraries, Museum, and Sculpture and Picture Galleries. The Royal Infirmary, an Elizabethan building, well situated on the lower slopes of the Law, is one of the best-managed institutions of this kind in the country. In addition to the infirmary with nearly three hundred beds, there are a convalescent home, a hospital for incurables, a reformatory training-ship, and several other institutions for the relief of suffering and the prevention of crime.

In the north-east of the town is a fine Gothic pile, built and endowed as a charity through the bequest of a native of Dundee, after whom it was formerly called the Morgan Hospital. Some years ago it was bought by the School Board, and under the name of the Morgan Academy it is now one of three schools in which systematic secondary education is offered by the Board. The High School for girls, and the new Post-office, are florid specimens of very modern renaissance work. The exchange, the Eastern Club, the Savings-Bank, and the Y.M.C.A. rooms are minor buildings with distinct architectural features. University College, now a part of St. Andrews University, was founded in 1883 by the gift of Miss Baxter and Dr. Boyd Baxter, and offers complete academic courses in arts, science, and medicine. There are now fourteen chairs and a few lectureships, the number of students being over 100. The buildings are mainly old and adapted to their present use by internal alterations, but a large building scheme is at present under consideration. The grounds, opening on the Nethergate, form one of the brightest spots in the city. There are also a Technical Institute endowed by Sir David Baxter, a modern and comfortable theatre, an interesting enclosed cemetery, the Howff, with many curious monuments, including one to the originator of the adhesive postage stamp, James Chalmers, a native of Dundee; and several statues, including a modern and costly bronze of the late Queen Victoria. Most of these works are disappointing. During the past few years there has been a marked improvement in the style of domestic and commercial architecture. Dundee possesses three or four good public parks. Of recent years a very large tract of ground has been recovered in the west end from the bed of the river, and the esplanade, nearly 2 miles long, affords very fine views.

Dundee has long been the seat of linen and canvas

manufactures, but in 1880 the introduction of jute revolutionised these industries; and the development of commerce took place so rapidly that the population of Dundee outgrew its accommodation. It is to this sudden and unexpected change that the inchoate and inadequate nature of much of the present residential part of Dundee is due. In 1898 the imports of flax were 19,999 tons, of tow and flax codilla 5075 tons, and of jute 255,550 tons. The manufactured article is exported all over the world, in nearly every description of goods, from the coarsest wrappings to the finest fancy designs in carpets. The number of persons employed is about 60,000, and the annual value of the goods is about £8,000,000. Besides what may be called the staple industry there are large shipbuilding and engineering works; and much spinning, weaving, and general machinery is manufactured in Dundee. The northern seal and whale fishery is carried on from this port, but the difficulty of a remunerative pursuit of this fishery is yearly increasing through the apparent gradual extinction of the whales. For many years the minor industry of marmalade making has been perhaps the best known of all those of Dundee; numerous well-equipped confectionery and biscuit works are also profitably conducted. The shipping trade of Dundee is a wide one, and the accommodation at the harbour is exceptionally fine. At the east end of the city a large area of ground has been reclaimed, and the deep-water jetties lately built will allow the largest vessels to unload at all states of the tide. There are four wet-docks, a tidal harbour, and two graving-docks. The number of vessels belonging to the port of Dundee at December 31, 1899, was 141, with a tonnage of 103,805. The opening of the new Tay Bridge in 1887 (80 feet higher up the river than the old Tay Bridge, opened in 1878, and blown down December 28, 1879, when over eighty persons were drowned), and the Forth Bridge in 1890, have so stimulated railway enterprise that Dundee is within ten hours of London by two distinct routes.

Dundee was at an early period a place of considerable note, and like most old towns was originally walled. It was made a royal burgh by William the Lion, was twice in the possession of the English under Edward I., was retaken by Wallace and Bruce, and in the reigns subsequent to that of the latter was ranked the third town in Scotland after Edinburgh. In 1645 it was besieged, taken, and sacked by the Marquis of Montrose; and six years afterwards it was stormed by Monk, when a great number of its inhabitants were put to death, not fewer, it is said, than a sixth part, or about 1800 persons. During the reigns of the Scottish kings Dundee was one of their places of residence. It is the birthplace of Hector Boece, the historian; and of Admiral Duncan, the hero of Camperdown. It was made a city in 1888, a county by itself in 1894, and returns two members to Parliament. Pop. in 1871, 119,141; in 1891, 155,640; in 1901, 160,671.

DUNDONALD, THOMAS COCHRANE, TENTH EARL OF, was born at Annfield, in Lanarkshire, on the 14th of December, 1775, and when a mere boy was entered on the books of the navy as a midshipman. He embarked in 1793 with his uncle, then Captain, and afterwards Sir Alexander Cochrane, in the *Hind*, of twenty-eight guns. After service in various other ships he joined the *Queen Charlotte*, the flagship of Admiral Lord Keith in the Mediterranean. While here he was despatched from Gibraltar Bay with the boats of the *Queen Charlotte* and the *Emerald* frigate to the relief of the *Lord Nelson* schooner, which had been hemmed in by several French vessels. This service was accomplished by him with

the greatest gallantry and success. On the 28th of March, 1806, he was appointed to the *Speedy* sloop-of-war of fourteen guns, and spread the terror of his name along the Spanish coast, having in the course of ten months captured thirty-three vessels, carrying 122 guns and 533 men, besides assisting in the capture of many others. One of his prizes was the *El Omea*, of thirty-two guns, for the capture of which by boarding, off Barcelona, he was gazetted post-captain in 1801. Before he obtained this rank a misfortune had befallen him. The *Speedy* and her crew, after a desperate attempt to escape from a French squadron under Admiral Linois, had been compelled to surrender on the 3d of July, and he was in consequence a prisoner. On being exchanged he returned home and remained on half-pay till October, 1803, when he was appointed to the *Arab*, of twenty-two guns, and employed in the blockade of Boulogne. The following year he removed to the *Pallas* frigate, thirty-two guns, and sailed for the coast of Spain with despatches for his uncle, Admiral Sir Alexander Cochrane, then blockading Ferrol. Here he was again most successful in making prizes, one of which, the *Fortuna* from Rio de la Plata, had specie on board to the amount of £150,000. In the spring of 1806, still in the *Pallas*, he proceeded to the Bay of Biscay, and after cutting out a corvette of fourteen guns and ninety-five men, which was lying in the Gironde under the protection of two batteries, scoured the French coast, destroying the semaphores and storming a battery. The following August he removed to the *Impérieuse*, of forty-four guns, and within a month destroyed fifteen of the enemy's vessels, laden chiefly with wine and provisions. The Spanish war of independence having now commenced, Lord Cochrane was sent to the coast of Catalonia to co-operate with the patriots, and rendered essential service by many daring exploits. One of these was his volunteered defence of Trinidad Castle, attached to the fortress of Roses, with eighty of his own men and as many Spaniards, and the repulse of an assault made by a French force of 1000. His character for daring being now completely established, he was selected in 1809 to superintend the destruction of a French fleet by fire-ships. It was anchored in Basque Roads under the protection of formidable batteries, and had for some time been watched by Admiral Lord Gambier. Unfortunately the Admiral was as much characterized by caution as Lord Cochrane was by daring, and failed duly to follow up the destruction which the latter had commenced, by succeeding, after almost superhuman efforts, in striking terror into the enemy by his terrific explosions, and driving several of their ships ashore. Lord Cochrane was chagrined above measure at this comparative failure, and as he had some time before been returned to Parliament, and was then sitting for Westminster, he did not hesitate, when a vote of thanks was proposed to Lord Gambier for his conduct, to oppose the vote, on the plain ground that, so far from deserving thanks, he ought not to be allowed to escape censure. The result was a court-martial, which acquitted Lord Gambier, and found all the charges brought against him groundless. The previous parliamentary career of Lord Cochrane had offended the government; his exposure of abuses at the admiralty had exasperated those who allowed or profited by them; and there cannot therefore be a doubt that, in official quarters, there was a willingness to stop his career of preferment, as soon as any plausible pretext could be found for it. This was unfortunately furnished sooner than any had anticipated. It would far exceed due limits to give a full account of the false report of Napoleon's downfall, which was got up in 1814 evidently for stock-jobbing purposes, and of the pro-

ceedings which followed upon it. Suffice it to say, that Lord Cochrane, suspected of being concerned in it, was brought to trial, convicted, fined, imprisoned, stripped of his rank of the knighthood of the Bath, and expelled from the House of Commons. He had from the first strongly protested his innocence, and many not inclined to favour him believed that at the worst he was the dupe of a more designing relative. It was remarked, moreover, that Lord Ellenborough, who presided at the trial, entirely forgot his position as an English judge; and so far from leaning to the accused as became him, was evidently bent on obtaining a conviction. On these and similar grounds great doubts were felt as to the justice of the sentence which had been pronounced, while the electors of Westminster did all they could to wipe off the stigma, by again returning Lord Cochrane as their member. The effect, however, was to ruin all his prospects in this country, which he therefore quitted in 1813, to command the fleet of Chill, which had thrown off the yoke of Spain, and was then struggling for independence. He fully repaid the trust thus reposed in him by many exploits, among the most memorable of which, both for the skill and gallantry displayed, and the important results which followed, was the cutting out, in 1820, of the *Esmeralda*, a large 40-gun frigate, from under the guns of the Castle of Callao. He subsequently obtained the command of the Brazilian fleet from the Emperor Dom Pedro, and after his return to Europe spent part of 1827 and 1828 in the cause of the Greeks. In 1830, after the accession of King William IV., and the formation of a Whig ministry, Lord Cochrane was restored to his rank in the British navy; in 1831, by the death of his father, he succeeded to the name and title of Earl of Dundonald; in 1841 he became vice-admiral of the blue; in 1847 he was again made a knight of the Bath; in 1848 he was appointed commander-in-chief on the North America and West India station; and in 1851 and 1854 respectively he became vice-admiral of the white, and rear-admiral of the United Kingdom. To the very last his intellect found full employment in the pursuit of inventions, from which he anticipated and partly realized both fame and profit; and in the composition of an autobiography, which, though left incomplete by his death on 31st October, 1860, in his eighty-sixth year, is a most interesting addition to this species of literature.

DUNDRUM BAY, an inlet of the Irish Sea, on the east coast of Ireland, county of Down, between St. John's Point on the north-east and Dunmore Head on the south-west, 5 miles south of Downpatrick. It is 9 miles wide at its entrance, and nearly 3 inland. It is exposed to a heavy swell in south and south-east winds.

DUNEDIN, a town, New Zealand, capital of the province of Otago, situated in lat. 45° 45' s. It stands at the upper extremity of an arm of the sea, about 13 miles long. It is about 9 miles from its port, Port Chalmers, with which it is connected by railway. Though founded in 1848 by the New Zealand Company, its more rapid progress dates only from 1861, when extensive gold-fields discovered in the neighbourhood attracted a large influx of population. It is as well laid out as the hilly character of its site will allow, is well paved, lighted with gas, and has a good supply of water from a reservoir at the head of the Water of Leith Valley, and another connected with the Silver Stream. Among the more prominent buildings are the municipal town-hall buildings, the post-office, hospital, and government buildings, the university, the new High School, several churches, and a Roman Catholic cathedral, the new museum, several banks, the athensium and me-

chanics' institute, the freemasons' hall, two theatres, &c. There are several parks, including the Jubilee Park and a fine race-course. Wool and gold are the staple exports of the town. Several manufactories are now in existence, among others two woollen factories, chemical works, a soap-work, foundries, boot and clothing factories, &c. An efficient system of horse and cable tramways affords a means of communication between the various parts of the town and the suburbs. There is a regular line of steamers between this port and Melbourne. Through the opening of the new Victoria Channel from Port Chalmers, vessels drawing 18 feet can now ascend to Dunedin. This channel is well defined by buoys and beacons. Pop. of Dunedin proper in 1901, 24,886; including suburbs, 52,390.

DUNES. See DRIFT SAND.

DUNFERMLINE, a royal and parliamentary burgh of Scotland, in the county of Fife, situated about 16 miles north-west of Edinburgh by way of the Forth Bridge. The principal part of the town is situated on a declivity, commanding most extensive prospects, and descending towards the Firth of Forth, from which it is distant 8 miles; but that portion of it termed Nether Town occupies a plain. The streets though narrow are well built, and within late years many improvements have been carried out. The town is now abundantly supplied with water. The nave of the Old Abbey Church, a venerable and interesting object, is all that remains of a sumptuous and richly-endowed Benedictine abbey, founded by Malcolm Canmore, and partially destroyed by Edward I. and again at the Reformation. It was the place of sepulture of the founder, his queen, and seven subsequent monarchs, including Robert Bruce, whose tomb and remains were brought to light in 1818, during the erection of the handsome New Abbey (parish) Church to which the ancient pile now forms a sort of vestibule, and which is a cruciform structure with a massive square tower. There are other handsome churches, including a U.F. church in the Gothic style, on the highest ground in the city. The principal public buildings include the corporation buildings, founded in 1876 (cost £20,000); the county buildings, erected in 1807-11, and now partly occupied as a court-house; St. Margaret's Hall (1878), containing a fine organ; the post-office; the high school; the free library; a technical school (opened 1899), like the library the gift of Mr. Andrew Carnegie; the public baths, &c. Dunfermline early took the lead in the manufacture of table-linen, and is still unrivalled by any other town in the kingdom. This manufacture and that of coloured worsted and cotton covers, which has become the other staple, now occupies about half the population. There are also iron-works, hand and power loom factories, extensive dye-works, and in the neighbourhood several important collieries. From a very early period Dunfermline was a royal residence, and there are still some ruins of a castle, anciently occupied by Malcolm Canmore; and the remains of a palace, which was rebuilt by Anne of Denmark, and was the birthplace of Charles I. By a charter of James VI. Dunfermline was erected into a royal burgh in 1588. It is one of the Stirling district of parliamentary burghs. Pop. in 1881, 17,084; in 1891 (mun. burgh), 22,157; in 1901, 25,250.

DUNGANNON, a municipal burgh of Ireland, county of Tyrone, on a height above a branch of the Blackwater, 35 miles west by south of Belfast. It is an ancient place, and was the chief seat of the O'Neills, the kings of Ulster, from the earliest period of history. Its principal edifices are the police barracks, a Roman Catholic, an Episcopal, a Presbyterian, and a Methodist church, royal schools, the

Provincial and Belfast banks, a Roman Catholic convent and school (1894), &c. Its chief manufactures are linen and earthenware. Pop. in 1891, 3812.

DUNGARVAN, a municipal borough and seaport of Ireland, in the county of Waterford, on a tongue of land formed in the bay of Dungarvan, by the mouths of the Briokly and Colligun. It is a finely-situated town, of agreeable appearance, and is much resorted to for sea-bathing. Its ancient castle, situated in the centre of the town, is now used as a barrack. There is a town-hall, market-house, hospital, churches, &c. The harbour is shallow and there is little trade. Many of the inhabitants depend on the fisheries. Pop. in 1881, 6806; in 1891, 5263; in 1901, 4850.

DUNG BEETLE, a term applied, from their habit of burying their eggs in dung, to a number of coleopterous insects of the Lamellicorn family, or that family of beetles in which the antennae terminate usually in lateral leaflets. They include the sacred beetle of Egypt, *Ateuchus* (*Saorabacus*) *sacer*, one of a group of large forms found on the Mediterranean shores. This species, which is immortalized in Egyptian carvings, is black, but not shining. The female places the egg in a pellet of dung and rolls it till a pill-like mass is formed; this it drags with the hind-legs, or pushes or carries on its head, till a suitable spot is found for its interment. The strong incurved spinous fore-legs are good tools for digging. This dispersal of dung and consequent subsoil manuring is said to have given the animal its peculiar sanctity among an agricultural people like the Egyptians. The genus *Copris* is of wide distribution; it burrows beneath the dung and lays its eggs in vertical shafts, each with a pellet of dung. *Aphodius* deposits its eggs in the dung. The *Geotrupes*, or 'shard-born beetle' of temperate regions, which flies in the evenings with a loud hum, lays its eggs in underground burrows, which are plugged with dung. The providing protection and nutrition for the larva by dung, and the instinct leading to it, is the more remarkable that with it the interest of the parent in its offspring ends. See PLATE at ENTOMOLOGY.

DUNKELD, a small town of Scotland, in Perthshire, on the left bank of the Tay, here crossed by a fine bridge, about 15 miles north by west from Perth, in the midst of beautiful and romantic scenery. It is a very ancient place, and from 850, when Kenneth I. removed the remains of St. Columba from Iona to a church which he had built here, became the metropolitan see of Scotland till supplanted by St. Andrews. The choir of the ancient cathedral, the ruins of which are finely situated on the banks of the river, is still used as the parish church. In the vicinity stands Dunkeld House, a seat of the dukes of Athole. The grounds of this dual residence are unsurpassed in Scotland for extent and beauty; they lie on both banks of the Tay, and include the cathedral, an uncompleted building that was intended for a dual palace, Craig Vinean and Craig-y-Barns, 50 miles of walks and 30 miles of drives, the Rumbling Bridge and falls of the Bran, &c. The town contains a town-hall and a memorial fountain. Near the cathedral are shown two magnificent larch-trees, said to have been brought from the Tyrol in 1788. They are perhaps the largest in Scotland, and estimated to contain over 400 cubic feet of timber each. On the opposite side of the river is the pretty village of Birmann. Pop. (1891), 618.

DUNKIRK (French *Dunkerque*), a town of France, in the department Nord, on the coast of the North Sea, 40 miles north-west of Lille, at the junction of several canals. Of the public squares, that of Champ de Mars and that adorned by a statue of Jean Bart (1845) are the most noteworthy. These

are several interesting churches, among the chief being the church of St. Eloi, built about 1560, with a fine tower about 300 feet high, now used as a belfry; the chapel of Notre-Dame des Dunes, founded in 1406 and restored in 1815; and the convent and church of St. Jean-Baptiste. Other buildings and institutions worthy of notice are the seventeenth-century town-hall; the post-office; the Palais de Justice; the museum, with some good statues and pictures; the arsenal; a public library; an exchange; a civil and a military hospital; a departmental prison; an orphanage; &c. Dunkirk is well protected by several forts, both on the land side and on that of the sea. Its manufactures are extensive, comprising fishing-nets, ropes, sail-cloth, straw hats, starch, soap, leather, earthenware, oil, chemicals, &c., besides distilling, sugar-refining, and other industries. Dunkirk is the chief port of departure of the French Iceland fishing fleets. The harbour has been greatly improved in recent years, so that now vessels drawing 26 feet can enter safely. There are four dry-docks and a patent slip. The trade is extensive and important. Dunkirk was a town under its present name, which means 'the church of the dunes', in the ninth century. It has played a prominent part in many wars, and has been besieged on many occasions. It was in English hands in 1662, when Charles II. sold it to Louis XIV. In the Peace of Utrecht (1713), and again in the Treaty of Paris (1763), England stipulated that its harbour and fortifications should be destroyed. It was unsuccessfully besieged by the Duke of York in 1793 at the head of a force of English and Dutch. The present commercial importance of Dunkirk dates from the period of the second empire. One of the most famous natives of the town is Jean Bart (1651-1709), the celebrated seaman. Pop. (1896), 39,718; with the suburbs Rosendael and Saint-Pol-sur-Mer, about 55,000.

DUNLIN (*Tringa alpina*), a British bird of the genus to which the sandpiper, knot, and stint belong. It is smaller than the snipe; is in winter ashy-gray above, white below, with dark spots on the breast; in the breeding season it is mottled with rufous above, and the breast is crossed with black. The straight bill is adapted for boring, and its cavity reaches to the extremity, not, as in the snipe, stopping short of the tip. In Scotland there are several local varieties, those of the east being a half larger than those of the Hebrides. It breeds on moors and marshes along with the snipe and plover, returning after the season to the sandy and muddy reaches of the coast.

DUNMOW, GREAT AND LITTLE, two parishes of England, in the county of Essex. The former contains the market-town of Great Dunmow, on a height above the Chelmer, 32 miles north-east of London. It has a large ancient church and several other places of worship, a library and scientific institution, &c. Pop. 2781. Little Dunmow is well known from the ancient custom in it of giving a flitch of bacon to any couple who, a year and a day after their marriage, could swear that they had neither quarrelled nor repented. It is said to have been claimed only eight times from the reign of Henry VI. up to 1860. There was no presentation from 1751 to 1855, when the old custom was re-instituted through the efforts of Harrison Ainsworth. It is still kept up, but claimants for the flitch are not always forthcoming. The church comprises part of that belonging to an old Augustinian priory founded in 1104.

DUNNAGE, a nautical term applied to loose wood or other miscellaneous substances, such as old masts or sails stowed amongst casks and other cargo,

either to prevent their motion or to protect them from the bilge-water in the hold.

DUNNET HEAD, a promontory of Scotland, in Caithness, at the western entrance of, and projecting into the Pentland Firth (here about 7 miles broad), the most northern point of the mainland of the kingdom. It rises to the height of 400 feet above sea-level. On the n.w. extremity there is a lighthouse 346 feet high.

DUNNING, JOHN, BARON ASHBURTON, an eminent lawyer, was the son of an attorney at Ashburton, in Devonshire, where he was born October 18, 1731. He was educated at the grammar-school of his native place, served as clerk to his father, and then came to London, entered the Middle Temple, and was called to the bar. He established his reputation in 1762 by drawing up a defence of the East India Company against the claims of the Dutch; and his already large practice was immensely augmented by his arguments on the side of Wilkes in the question of the general warrants. In 1766 he was chosen recorder of Bristol, and in 1768 solicitor-general, which office he resigned in 1770 in consequence of the resignation of his patron, Lord Shelburne, by whose influence he had been chosen member for Calne, in Wiltshire. In parliament he remained a firm opponent to the ministry who conducted the American war; and on the return of Lord Shelburne to power in 1782 he was made Chancellor of the Duchy of Lancaster, and advanced to the peerage. He died at Exmouth on August 18, 1788.

DUNNOTTAR, a parish of Kincairdineshire, Scotland, famous for its ancient ruined castle, situated on a cliff almost detached from the mainland, overlooking the German Ocean, 2 miles south by east from Stonehaven. Some sort of fortress or castle stood here from very early times. Blind Harry tells a fable of how Wallace set fire to a church on this rock, in which 4000 English had taken refuge. The older part of the ruins probably belongs to about 1394, when the castle was rebuilt by Sir Wm. Keith, marshal of Scotland. During the Commonwealth the castle was selected as the strongest place in the kingdom for the preservation of the Scottish regalia from the Republican forces which had overrun the country. Lambert, one of Cromwell's generals, besieged the place, which was starved into capitulation. The regalia had, however, been previously removed by a stratagem, in which Mrs. Granger, the wife of the minister of an adjoining parish, played the chief part. She brought away the crown hid among some clothes in her lap, her servant-maid carrying the sword and sceptre in a bag of flax on her back. In 1885 the castle was used as a state prison for 167 Covenanters, who had been seized at various times in the west of Scotland during the persecution under Charles II. They were all thrown into a chamber, since called the 'Whig's Vault', where many of them died. In Dunnottar churchyard (near Stonehaven) there is a monument to those Covenanters, and here, in 1793, Sir Walter Scott met Robert Paterson, the original 'Old Mortality'. The fortress was dismantled soon after the rebellion of 1715, on the attainder of James Keith, the last earl-marshall.

DUNOIS, JEAN, Count of Orleans and of Longueville, was born about 1403, and was a natural son of Louis, duke of Orleans. Dunois made the name 'Bastard of Orleans' illustrious by his military exploits in the war for the liberation of France, then completely in the power of England. He began his career with the defeat of Warwick and Suffolk, whom he pursued to Paris. Being besieged by the English he defended Orleans with the greatest courage until relieved by the Maid of

Orleans. To Dunois belongs almost entirely the honour of expelling the enemies of his country from Normandy and Guiana. In 1450 he had completely freed France from the presence of the English, and it may truly be said that Charles VII. was indebted to him for his crown. Dunois received from him the title of 'deliverer of his country', the county of Longueville, and the dignity of high chamberlain of France. Louis XI., who hated the ministers and counsellors of Charles, deprived Dunois of all his titles and dignities; but on finding how dangerous an enemy he had raised (Dunois becoming the soul of the League for the Public Good which was formed against the king), the royal favour was speedily extended, and a complete reconciliation took place at Conflans, (1465). He died in 1468.

DUNOON, a celebrated watering-place in Scotland, county of Argyll, beautifully situated on the shore of the Firth of Clyde, 25 miles west by north from Glasgow. Including Kilm and Hunter's Quay it stretches for more than 3 miles along the coast. There are some handsome churches and other public buildings, including a convalescent seaside home. There is an immense passenger traffic here in the summer season carried on by means of the Clyde steamers, and there is a fine pier recently reconstructed. On a green rocky knoll are slight remains of the castle of Dunoon, a residence of the family of Argyll till the early part of the seventeenth century. Pop. in 1891, 5288; in 1901, 6772.

DUNS, or (according to the spelling formerly in regular use) DUNSE, a town in Berwickshire, 85 miles south-east of Edinburgh, situated at the foot of Duns Law, near the river Whitadder. It is a neat place, consisting of several spacious streets terminating in a square, where the markets are held, and in the centre of which there is a town-house in the Gothic style. Besides the established church, an elegant fabric with a spire, there are various other places of worship and a high school. Pop. in 1881, 2437; in 1891, 2198; in 1901, 2206.

DUNS, JOHN, commonly called *Duns Scotus*, an eminent scholastic divine regarding whose life little or nothing is really known. Some place his birth in the year 1265, others in 1274; probably he was a Scot by origin, but Ireland and England also claim him. He is said to have been admitted when young into an institution belonging to the Franciscan friars at Newcastle, whence he was sent to Merton College, Oxford. Becoming celebrated for his skill in scholastic theology, civil law, logic, and mathematics, he was in 1301 appointed divinity professor at Oxford, and the fame of his learning and talents drew crowds of scholars from all parts. In 1304 he was sent by his superiors to Paris, in the university of which city he was admitted to the highest honours, and appointed professor and regent in the theological schools, in which situation he acquired the title of 'the most subtle doctor'. In 1308 he was sent to Cologne by the head of his order, to teach theology, but was cut off by apoplexy. None of these statements, however, is regarded as well founded. Duns opposed Thomas Aquinas on the subject of grace and free-will; and hence the *Scotists* are opposed to the *Thomists*. The immaculate conception of the Virgin Mary was another of the tenets which divided these fierce antagonists; and it is believed by many authors that it was Duns who first propounded it. There can be no doubt but that the bitterness of the quarrel between the *Scotists* and *Thomists* was intensified by the strong rivalry of the Franciscans and Dominicans, the order to which Duns Scotus and Aquinas respectively belonged. Duns was also the apostle of

realism, which was opposed to the systems of nominalism and conceptualism promulgated by the other sections into which the schoolmen were divided. (See SCHOLASTICISM.) Duns's reputation latterly sank so low, especially at Oxford, that his name gave rise to the word *dunce*. He left behind him numerous works, which deal with grammar, logic, metaphysics, and theology, and were collected by Luke Wadding, in twelve vols. folio (Lyons, 1639).

DUNSTABLE, a municipal borough of England, in the county of Bedford, 32 miles north-west of London, at the eastern base of the Chiltern chalk-hills. It was an important Roman station, and had a palace and a priory founded by Henry I. Part of the priory church is included in the parish church, a fine edifice exhibiting the Norman, Early English, and Perpendicular styles of architecture, and latterly restored. There is a grammar-school (rebuilt in 1888). Dunstable is famous for its manufactures of straw plait and bonnets; there are also printing and whitening works. Pop. (1891), 4518; (1901), 6147.

DUNSTAN, St., an Anglo-Saxon divine and statesman of the tenth century, alike celebrated in legendary and authentic history, was born at Glastonbury in 925, and was educated in the famous abbey at that place. He acquired a knowledge of the Latin language and of philosophy, and studied the Scriptures and the writings of the fathers; besides which he became skilled in music, painting, carving, and working in metals. Through his high connections he was introduced early in life to the court of King Athelstan, but some indiscretion, or the jealousy of rivals, compelled him to retire from court; and the disappointment of his prospects, together with a dangerous fit of sickness, seriously impressed his mind, and led him to seek for tranquillity in the monastic life. He took the vows at Glastonbury, and lived for a time in a small cell as an anchorite. On the death of Athelstan, Edmund, the brother and successor of that prince, invited him to court, and after a period of estrangement appointed him abbot of Glastonbury (945), where he introduced great reforms. Edred, the next king, made him his prime minister and principal director in civil and ecclesiastical affairs. On the death of Edred (955) his nephew Edwy, who was probably not more than fourteen years of age, ascended the throne. The enmity of the profligate courtiers was particularly directed against Dunstan, who was obliged to flee from his native country. He took refuge in Flanders, where he remained till he was recalled to England by King Edgar, to whom the imprudent Edwy had been obliged to cede a part of his dominions. Dunstan was made Bishop of Worcester, and also of London, and when Edgar became possessed of the whole kingdom (959), was raised to the see of Canterbury. In this station his influence was exerted in promoting the introduction of the rule of St. Benedict, which inculcated vows of celibacy upon members of the monastic institutions. Many of the secular priests, who were generally married, were now expelled from religious houses, and replaced by Benedictine monks. Dunstan's zeal for education and a higher morality were equally marked. During the reign of Edgar he was supported in the execution of his plans by the royal authority; but under Edward the Martyr he experienced great opposition from the patrons of the secular clergy; and after Ethelred II. became king his influence still further declined, and he thenceforward interfered but little in public affairs. He died in 988. Few characters in English history have been more variously represented than that of Dunstan. The monks represent him as the most learned and accomplished prelate and most eminent statesman of his age. Popular tradition

painted him as a master of magic arts, subjecting demons to his power. Osborn, who wrote the life of Dante, a century after his decease, first appears to have propagated the legendary tales, of which no notice is taken by a contemporary anonymous biographer. See Bishop Stubbs's *Memorials of St. Dunstan in the Rolls Series*.

DUODECIMAL SYSTEM, in numeration. In recent times it has been proposed to substitute for the present decimal scale of nine digits and a cipher a duodecimal scale of eleven digits and a cipher, thus making twelve (Latin, *duodecim*) its base. In favour of the system it is urged that 12 admits of a greater number of division into equal parts by 2, 3, 4, and 6; but most mathematicians consider it as not having sufficient superiority over decimals to counterbalance the immense inconvenience of making a change. The term *duodecimals* is also given to the system of compound numbers used in calculating surfaces and solidities from measures taken in feet, inches, and lines.

DUODECIMO (often contracted *12mo*) is that form of volume in which each leaf forms a twelfth part of the sheet or folio.

DUODENUM, the commencement of the intestinal canal, the first of the smaller intestines, so called because in some animals it is found to be as long as the breadth of twelve fingers.

DUPATY, CHARLES MARGUERITE JEAN BAPTISTE MEROIER, born 1746 at Rochelle. In 1767 he became advocate-general to the parliament of Bordeaux, afterwards *président à mortier* of that body, and drew upon himself by his love of strict justice the persecutions of the ministerial despotism which oppressed France in the last years of Louis XV. Having written in the name of the parliament of Bordeaux against the Duke of Aiguillon when this nobleman became minister (1770), he was sent to Pierre-en-Cise (a fortress at Lyons, once a state prison), and afterwards banished, until the accession of Louis XVI. Being acquainted with the defects of the ancient administration of justice in France, he made every exertion to expose them. The memorial by which he preserved the lives of three innocent citizens of Chaumont who were condemned to the wheel deserves particular mention. His other works are *Reflexions historiques sur les Loix criminelles*, a valuable work; various *Discours académiques*; and *Lettres sur l'Italie en 1785*, which appeared in 1788 in two volumes. These letters, among many prejudiced views, contain some excellent observations on the arts, and interesting descriptions of natural scenery; but his style is often disfigured by laboured ornaments. He died in 1788 at Paris.—His son, **LOUIS MARIE CHARLES MEROIER**, born at Bordeaux September 29, 1771; died at Paris November 12, 1825. He was the restorer of sculpture in France, a member of the Institute, and professor in the *École des beaux Arts*; was at first an advocate, served during the revolution as a dragon, then as cartographer, and finally went to Rome, where he studied sculpture under the direction of Lemoit, and during a residence of eight years made himself known by numerous works. His principal productions are *Ajax* pursued by Neptune, his equestrian statue of Louis XIII. (1816), and *Orestes* pursued by the Furies. Cortot, his successor in the Academy, completed some of his works.

DUPERRÉ, VICTOR GUY, BARON, born at Rochelle in 1775, first sailed in a merchant vessel, but afterwards entered the navy, and having been taken prisoner by the British in 1796 did not obtain his liberty by exchange till three years after. In 1803 he was employed with the flotilla of Boulogne, and afterwards cruised with the *Vétéran*, commanded by Jerome Bonaparte, on the coasts of Africa and America. After his return he was appointed in 1806 to the

command of the *Strène*, in which, in 1808, he carried out troops to Martinique. On his return he was intercepted by an English man-of-war, which endeavoured to prevent him from entering L'Orient; but after a fight, in which he displayed much valour and good naval tactics, he gained the shelter of the forts on the island of Groix, and ultimately reached the port in safety. Napoleon rewarded him by conferring on him the rank of captain. He now took the command of the frigate *Bellona*, sailed in 1809 from St. Malo for the island of Mauritius, and during a cruise in the Indian Sea took the British corvette *Victor*, several merchant vessels, and the Portuguese frigate *Minerva*. In 1810 he returned with his prizes, and reached Mauritius in view of the British squadron by which that island was then blockaded. Three years later he again sailed with three ships, and returned after taking two large British East Indiamen. He found the island blockaded, and though he forced the blockade the whole island was forced to capitulate in 1810. After Duperré's return he received the title of baron; in 1811 he was raised to the rank of vice-admiral, and commanded in the Mediterranean. In the beginning of 1812 he was naval commander-in-chief in the Adriatic, and had succeeded in forming extensive building docks at Venice, and raising a powerful squadron, when the events of 1813-14 obliged the French to evacuate Italy. During the Hundred Days he guarded Toulon against the attempts of the British and Sicilian troops which landed at Marseilles. In 1818 he returned to the West Indies to take the command of the French ships on that station. In 1823 he commanded the squadron employed in the siege of Cadiz. In 1830 he superintended the landing of the troops on the coast of Algiers, and contributed greatly to the capture of the capital. After the revolution of July he was raised to the peerage, and held the portfolio of marine, first from 1834 to 1836, and again in the ministry of 1840. Sickiness, however, obliged him to resign, and he died at Paris in 1846.

DUPETIT-THOUARS, ARISTIDE AUBERT, a famous naval captain, born at Boumols, near Saumur, in 1760, when a mere boy was so smitten with the love of a sea life by reading Robinson Crusoe that he ran off from the military school of Laflèche and attempted to enter himself as a cabin-boy in a vessel at Nantes, but was discovered and sent back. He afterwards entered the military school at Paris, and laboured assiduously at his studies, though his own inclinations were thwarted and he was intended for land service. At length, however, on the commencement of the war with England in 1778 he had an opportunity of entering the navy, and so distinguished himself on several occasions in the West Indies that he obtained the command of the *Tarleton*. He afterwards fitted out a vessel by subscription, and set out with the double object of searching for La Pérouse and of carrying on the fur trade on the north-west coast of America. The voyage proved very unfortunate. After he had been taken prisoner by the Portuguese, and long lain in a dungeon at Lisbon, he went to North America, where he made two attempts to reach the north-west coast by land. As soon as the storms of the French revolution were over he came back and again entered the naval service. On the expedition to Egypt he commanded an 80-gun ship. He foresaw the only result which could be anticipated if it was resolved to wait for Nelson's attack in the place selected in the roads of Aboukir, and advised immediately to set sail. But though his advice was disregarded he fought with undaunted valour against the enemy, and fell in the struggle, 1st August, 1798. His MSS. and correspondence were published by his sister in three vols. 8vo, under

the title of *Lettres, Mémoires et Opuscules d'Aristide Dupetit-Thouars*.

DUPLEIX, JOSEPH, governor of the French possessions in India, was the son of a wealthy farmer-general and director of the East India Company, and born in 1697. He early displayed considerable talent for mathematics and the exact sciences, and in 1720 was appointed first member of council at Pondicherry, and ten years afterwards director of the French factory at Chandernagore. In this capacity, while attending zealously to the interests of his employers, he contrived by engaging in private trade to accumulate a large fortune. In 1742 he received the appointment of governor-general, and proceeded to Pondicherry to enter upon the functions of his new office. At this period he conceived the magnificent design of rendering France paramount in India, and with this view cultivated assiduously the friendship of the surrounding native potentates. On the breaking out of war between Great Britain and France in 1746 Duplex formed the project of wresting Madras from the former country, but was anticipated by La Bourdonnais, governor of Bourbon and the Mauritius, who, having fitted out an expedition from thence, arrived before the town and compelled its surrender. The wrath of Duplex at this achievement was extreme, and his influence so far prevailed that, in disregard of the terms of capitulation, the British governor and the principal functionaries were transported as prisoners to Pondicherry, and other conditions of the compact shamelessly violated. This rivalry of their two leading officers proved extremely detrimental to French interests in India, but the energy and talents of Duplex would, if properly supported, have secured for his country an ascendancy which Britain would have had some difficulty to overthrow. By his vigorous defence of Pondicherry the British admiral Boscawen was compelled to raise the siege which he had laid to it, and by his diplomatic abilities additional and important acquisitions of territory were made from the native powers. Unfortunately for France, unworthy jealousies and personal interests exerted such influence with the home authorities that no adequate support was furnished to Duplex in the prosecution of his scheme; and this, combined with constant importunities from the British court, who represented him as a firebrand and stirrer up of strife, occasioned his recall in 1754. He proceeded to France, and there experienced the treatment which, at that disgraceful period of her history, was manifested by France towards all her great men in India, without exception. No redress could be obtained by him, and payment of nearly 13,000,000 francs which he had advanced to the French factory at Pondicherry was shamelessly withheld. In a vain endeavour to procure what was justly due to him, and a recognition of his services to the public, Duplex lingered out the remaining years of his life, and died in poverty in 1764.

DUPONT, JACQUES CHARLES, surnamed *De l'Eure*, a French statesman, was born 27th February, 1767, at Neubourg, in Normandy. He was practising as an advocate in his native province when the revolution broke out (1789), and was made a judge in one of the law courts at Louviers in 1792. In 1798 he was a member of the Council of the Five Hundred, which was dispersed by Murat on the 18th Brumaire. In 1811 he was nominated president of the court of justice at Rouen, and in 1813 vice-president of the corps législatif. On the restoration of the Bourbons Dupont signalled himself as a leader of the opposition. In 1830, after the revolution of July, he was made minister of justice—an appointment which he threw up at the end of six months. After the fall of Louis Philippe he became a member of the provi-

sional government. On the accession of Napoleon III., in 1852, he ceased to take part in public affairs. He died 2d March, 1855, at Rouge-Pierre, in Normandy. Dupont was called by his political friends the 'Aristides of French Liberalism.'

DUPONT, PIERRE, surnamed *De l'Eure*, born at Chabanaise, in 1765, was educated for the artillery, and served first with the French legion in the Dutch service, and in 1791 in the French army, where he was appointed adjutant to General Dillon in the army of the north. In 1792, during the retreat from Tournay ordered by Dumouriez, Dillon was slain, and Dupont in endeavouring to defend him was severely wounded. When sufficiently cured he again joined the army in Belgium. Here, by his skillful arrangements as a staff officer, he prevented Denmark from falling into the hands of the Duke of York, and was promoted to the rank of brigadier-general. In 1798 he quitted the army to escape from the storms of the revolution, and first appeared again as superintendent of the topographical cabinet under the directory, which also made him director of the war dépôt. After the 18th Fructidor he lost his employments for a short time; but after the proceedings of the 18th Brumaire, in which he took an active part, he was appointed head of the general état-major of the army of reserve assembled at the foot of the Alps, and distinguished himself in Italy at the battle of Marengo. As governor of Piedmont he, in 1800, pushed forward into Tuscany, where he established a provisional government, and then defeated a superior Austrian force at the passage of the Minio, near Poggio. In 1804 he was invested with the title of count, and in 1805 joined the army in Germany, where he exerted himself near Ulm, and freed Marshal Mortier when hemmed in by a body of Russian troops. He was also very active in the campaign of 1806 against the Prussians, and in 1807 contributed by his skillful tactics to the victory of Friedland. In 1808 he obtained the command of a division in Spain, but brought himself into such a position that he was obliged to sign the disastrous capitulation of Baylen. Napoleon was so provoked that he brought him to trial, and kept him a prisoner till 1813. He was first restored to active service on the restoration of the Bourbons, and in 1814 became minister of war, but only held the office for a short time. He next obtained the command of the twenty-second military division, and though deprived of it during the Hundred Days, resumed it on Napoleon's second downfall. In 1815 he was elected member of the chamber of deputies by the department of Charente, and retained it with some interruptions till the revolution of July. He lived in retirement after 1835, and died at Paris in 1840.

DUPONT, PIERRE, a writer of French political songs, was born at Lyons, 23d April, 1821. He was educated by his godfather, a priest, and began to write and compose songs at an early age. After issuing a volume of poems in 1844, he went to Paris and obtained a place in the office of the secretary of the Institute. After the revolution of Feb. 1848 he came forward as the minstrel of socialism, and proved obnoxious to the government which came into power in December, 1852. He was arrested, imprisoned, and condemned to be banished for seven years; but the intercession of his friends soon procured his release. After that event he spent a gay and careless life by the Rhone, penning and singing his ballads one day in the mansions of the rich and the next in the cottages or workshops of the poor. His songs, which brought him fame, did not bring him fortune, and he died comparatively poor at St. Etienne (Loire), 25th July, 1870. His works (songs and music) appeared in 1854 in four vols. 8vo.

DUPONT DE NEMOURS, PIERRE SAMUEL, born at Paris, December, 1739, distinguished as well for his knowledge and talents as for his mild and benevolent character, his excellent principles, and his blameless life; lived almost unknown at Paris as a private man of letters until 1778, when his principles of philosophy and political economy set forth in his *Les Ephémérides du Citoyen*, excited the displeasure of the minister Choiseul, and obliged him to leave France. Several foreign princes offered him a reception and conferred honours upon him. He returned, however, to his native country, and accepted of a small place given him by Turgot, minister of finance. In 1782 and 1783, with Dr. Hutton, the English agent, he negotiated the basis of the treaty by which the independence of the United States of America was acknowledged. As inspector-general of commerce and manufactures, and as a councillor of state, he afterwards did much to encourage French industry. In 1787 and 1788 he was appointed by Louis XVI. secretary to the assembly of the notables. In 1789 he became a member of the first national assembly, where he distinguished himself by his principles, his courage, his talents, and his firm opposition to the intrigues of factions. He was twice president of the national assembly, and always supported moderate principles. Under Robespierre he was imprisoned, and nothing but the fall of the tyrant preserved him. He was afterwards a member of the council of elders. After the directory was abolished he went to America, in 1798. In 1803 he returned to France, but did not at that time take any office, notwithstanding the offers made him by Napoleon. The confidence of his fellow citizens followed him in his retirement, as was shown by his appointment to several important offices. In 1814 Dupont was made secretary of the provisional government which prepared the way for the return of the house of Bourbon to the throne of France. After Napoleon's return from Elba he went again to America, of which country his two sons had already become citizens. He died there in 1817. Besides various political treatises, he is likewise the author of a French translation of the first three cantos of the *Orlando Furioso*.

DÜPPEL, a fortified village in the province of Schleswig, Prussia, on the coast of the Little Belt. The place is of considerable strategical importance, and has been the scene of some severe struggles between the Danes, to whom it formerly belonged, and the Germans. In 1848 the latter were defeated by the Danes before this place, which, however, was carried by assault the following year. During the years 1860-68 the Danes had strengthened the position by all the means the modern art of fortification put within their power, but it was captured by the Prussians in 1864, after a siege and bombardment which lasted nearly two months.

DUPUIS, CHARLES FRANÇOIS, a member of the French National Institute, was born at Tré-le-Château, near Ghent, in 1742, and instructed by his father in mathematics and surveying. The Duke de la Rochefoucauld sent him to the Collège d'Harcourt, to pursue his studies; and in his 24th year he was made professor of rhetoric at Lisieux. His intimacy with Lalande, and his own inclination, led him to devote himself particularly to mathematics; the knowledge and the prejudices of that learned man had a great influence on him. His *Mémoire sur l'Origine des Constellations et sur l'Explication de la Fable par l'Astronomie* (1781) is erudite, but rather sophistical. In 1788 he became a member of the Académie des Inscriptions et Belles-lettres, and went to Paris, where he was named one of the four commissioners of public instruction, to ascertain the resources of all the institutions for education and learning in Paris.

As a member of the national convention, he was constant in his support of moderate measures. On this account he was chosen a member of the Council of Five Hundred; and the reputation which he there acquired for activity and information procured him admission into the National Institute. The tribunal and the corps législatif both proposed him as a senator. His work, *Origine de tous les Cultes, ou la Religion universelle* (1794, three vols. 4to, with an atlas), is an attempt to discredit all revelation. In this performance he attempted to explain, not only all the mysteries of antiquity, but also the origin of all religious traditions. An abridgment in one volume afterwards followed. His two works on the Pelasgi, their origin in Ethiopia, their spreading over Lybia, Cyrenaica, and the north of Africa, and thence to Spain, Greece, and Italy, attracted great attention. His treatises on the zodiac of Denderah, and on the Phoenix, succeeded. In his last work, *Mémoire explicatif du Zodiaque chronologique et mythologique* (1806, 4to, engravings), he maintained that the astronomical and religious opinions of the Greeks, Egyptians, Chinese, Persians, and Arabians, had a common origin. He died at his estate near Dijon, 1809, sixty-seven years old, and left in manuscript a work on cosmogony and theogony, the object of which was to confirm the theory he had laid down in his *Origine de tous les Cultes*. He also endeavoured in this work to explain hieroglyphics.

DUPUYTREN, GUILLAUME, BARON, a famous French surgeon and anatomist, was born in 1777 at Pierre-Buffière in Haute-Vienne, studied at Paris after 1789, and in 1795 was appointed assistant-dissector to the medical faculty at Montpellier. In 1801 he obtained the situation of overseer of anatomical labours at Paris; and became in 1808 second, and in 1815 first surgeon to the Hôtel Dieu. The professorship of surgery to the medical faculty, conferred upon him in 1818, was exchanged in 1818 for a clinical lectureship in the above hospital. About the same time he obtained a seat in the Academy. In 1823 he was appointed first physician to the king, Louis XVIII., and retained the same situation under Charles X. A stroke of apoplexy had impaired his activity in 1833, and he died at Paris in 1835. He possessed extraordinary acuteness in respect of diagnosis, united with remarkable skill and dexterity in the most dangerous operations, in performing which he had a firmness of nerve which was never shaken. He invented several surgical instruments and modes of operation, and also made some discoveries in pathological anatomy. His imposing personal appearance and powerful intellect gave him a great command over his patients and pupils. His writings, relate to some points of surgery and pathological anatomy. Some of his pupils united in publishing his *Oral Lectures on Clinical Surgery*, delivered at the Hôtel Dieu (Paris, four vols. 1830-34); and his *Theory and Practice as to the Treatment of Wounds by Warlike Weapons* was published by Paillard and Marx (two vols. 1834).

DUQUESNE, ABRAHAM, a French admiral under Louis XIV., was born at Dieppe, in 1610, and acquired his knowledge of naval affairs under his father, who was an experienced captain. In his seventeenth year he was in the sea-fight off Rochelle, and distinguished himself during and after the year 1637 in the war against Spain. In 1644 he entered the service of Sweden. He was recalled in 1647 to France, and commanded the expedition against Naples. Bordeaux, which had rebelled, he reduced, notwithstanding the assistance afforded it by Spain. In the Sicilian war he thrice defeated the combined fleets of Holland and Spain, under the renowned De Ruyter, who was mortally wounded in the last en-

gement. After he had reduced Algiers and Genoa to the necessity of supplicating the mercy of Louis XIV., the king conferred upon him the fine estate of Bouchet, and made it a marquise, with the title of Duquesne. More than this he could not do, because Duquesne was a Protestant. He was, also, the only person exempted from the banishment of his sect, occasioned by the repeal of the edict of Nantes. He died at Paris in 1688.

DURA MATER. See BRAIN.

DURANCE, a river, France, which rises in Mount Genève, on the west slope of the Cottian Alps; flows circuitously first south-east, then south-west; and after a course of about 180 miles joins the left bank of the Rhone about 4 miles below Avignon. Though a large stream, its current is so rapid, and so much encumbered with debris, that it is nowhere navigable. It often commits great ravages by inundation.

DURANGO, a town in Mexico, capital of the province of New Biscay, or Durango; 836 miles N.W. Mexico; pop. 27,000. It is a bishop's see. The town is situated on an elevation, 6845 feet above the sea. The air is healthy, the surrounding country fertile, producing an abundance of wheat, maize, fruits, and the trade is considerable. The state of Durango is fertile in places, and has valuable gold, silver, and iron mines. Its area is 42,511 square miles, and its population (1888) 265,930.

DURAZZO (ancient, *Dyrrhachium* or *Epidamnus*), a seaport, European Turkey, province Albania, on the Adriatic, 50 miles south by west of Scutari. It was originally founded by a colony of Greeks from Corcyra, and was long the most important maritime town of Illyria. A few columns and marbles are now almost the only remains of the ancient city; the modern town is a poor place of about 1200 inhabitants.

DURBAN, a town and the chief or only seaport of Natal, is situated on the northern shore of the land-locked inlet known as Port Natal. It is well laid out and solidly built, the principal buildings being a town-hall, museum, library, theatre, &c., while there are several public parks besides the Botanical Gardens and the Town Gardens, and a race-course. The climate on the whole is healthy, and there is now a good supply of water. Tramways are laid throughout the town, and there is a railway which connects it with Pietermaritzburg and the interior, besides two local lines. There is a bar at the entrance to the harbour, but recent operations have so far obviated this that vessels of large tonnage can now enter. On the 'Bluff' at the entrance to the port a battery of heavy guns has been placed. Durban was founded in 1834, and named after Sir Benjamin D'Urban, for some time governor of Cape Colony. Pop. (1891) 25,512.

DÜREN (ancient, *Marcodurum*), a town, Rhenish Prussia, on the right bank of the Roer and the railway from Aix-la-Chapelle to Cologne, 16 miles east by north of Aix-la-Chapelle. It is of Roman origin, and is mentioned under its ancient name by Tacitus. In 1543, after an obstinate resistance, it was taken and destroyed by the Emperor Charles V., at the head of 50,000 men. The modern town has some handsome churches, a gymnasium, important manufactures of woollens, paper, leather, and hardware; several large distilleries, and an extensive trade. Pop. (1895) 24,531; (1900) 27,171.

DÜREK, ALANUR, the greatest of German painters, born at Nürnberg, 1471. His father was a skillful goldsmith of Hungary, and himself instructed his son Albert. Dürer's talent early developed itself, and although he had made great progress in his father's profession by the time he was fifteen, his in-

clination took a decided turn for painting. Michael Wohlgemuth, then the best painter in Nürnberg, became his instructor in 1486. Having finished his studies he entered upon his travels, and, in 1490, travelled through Germany and Alsace. In 1492 he passed through Colmar and Basel, and in 1494 returned home. Here he executed his masterpiece, a drawing of Orpheus. To please his father he married the daughter of Hans Frey, a celebrated mechanic; but this connection embittered his life, and perhaps brought him to an early grave. In 1505 he went to Venice to accomplish himself in his art. His abilities excited envy and admiration. He painted the Martyrdom of Bartholomew for St. Mark's church, which painting was purchased by the Emperor Rodolph, and removed to Prague. He also travelled to Bologna, to improve his knowledge of perspective. This journey had no effect upon his style. At his return, in 1507, begins the proper era of his greatness. In 1520 he again visited the Netherlands, probably for amusement only. His fame spread far and wide. Maximilian I. appointed him his court-painter, and Charles V. confirmed him in this office, bestowing upon him at the same time the painter's coat of arms, namely, three escutcheons argent in a deep azure field. Dürer was in favour with high and low. All the artists and learned men of his time honoured and loved him, and his early death, in 1528, was greatly lamented. Profound application, great facility in the mechanical part of his art, and a remarkable talent of imitation, were the characteristics of Dürer, and enabled him to exert a great influence on the character of German art. He was the first in Germany who taught the rules of perspective, and of the proportions of the human body, according to mathematical principles. His treatise on proportions was occasioned, it is said, by his studies on the picture of Adam and Eve. He not only made use of the burin, like his predecessors, but was also the inventor of etching, or, if not the inventor, the first who excelled in the art. He invented the method of printing wood-cuts with two colours. His great mathematical knowledge enabled him to form a regular system of rules for drawing and painting. He wrote the first book on fortification, in Germany, and showed how to cast the letters of the alphabet according to fixed proportions, by geometrical calculations. He was particularly eminent as a portrait painter. He had the power of catching the exact expression of the features, and of delineating all the passions. Among his best engravings in copper are his Fortune, Melancholy, Adam and Eve in Paradise, St. Hubert, St. Jerome, and the Smaller Passion (so called) in sixteen plates. Among his best wood-cuts are the Greater Passion (so called), in thirteen plates; the Smaller Passion, with the frontispiece, thirty-seven pieces; the Revelation of St. John, with the frontispiece, fifteen plates; the Life of Mary, two prints, with the frontispiece. Bartsch, however, has made it more than probable that Dürer himself did not engrave in wood. He only made the drawings on wooden tablets, which were then cut by form-cutters, of whom there were many skillful ones at that time. Dürer has also much merit as a writer. His writings, which were afterwards translated into Latin, French, &c., were published in a collected form at Arnhem, by J. Janzen (1608, folio). See W. B. Scott's *Albert Dürer, his Life and Works*, and Mrs. Heston's *History of the Life of Albert Dürer* (both London, 1869), and Dürer's *Briefe* *Tagebücher* und *Reise*, edited by Tausing (Vienna, 1872).

DURESS, in law is restraint or compulsion; and it is a general principle, that a contract made under compulsion is not binding; and many acts will be

excused on this ground, which would otherwise be blamable. The dureses may consist of imprisonment, threats against one's life, &c.

D'URFEY, THOMAS, a person of some note as a poet and wit in the latter half of the seventeenth century, was born at Exeter in 1663, being descended from a family of French Protestant refugees settled there. He was bred to the legal profession, but soon found a more congenial occupation in writing plays and songs, which, more especially the latter, acquired great popularity, and made him a favourite at the court of Charles II. The bulk of these are extremely licentious, and have become almost forgotten. D'Urfe's name is now principally remembered in connection with his Pills to Purge Melancholy, a collection of songs and ballads, partly his own, and partly gathered from other sources. It was published in 1719 in five volumes, and was reprinted recently. Very few of the pieces are of merit in a literary point of view, many of them indeed are utterly contemptible, and the extreme license pervading the whole collection renders it quite unfit for general perusal. D'Urfe died on Feb. 26, 1723.

DURHAM, one of the three English counties called counties *palatine*. (See COUNTY PALATINE.) The Bishop of Durham was formerly at the head of the administration of justice in this county, but his authority was transferred to the crown by 6 and 7 William IV. cap. xix. Durham is bounded on the E. by the German Ocean; on the N. by Northumberland, from which it is divided by the rivers Tyne and Derwent; by Cumberland on the W., and by Yorkshire on the S., the river Tees parting the two counties. The outline forms an irregular triangle, the western angle of which is largely occupied by mountains of the Pennine Range. This tract, however, is enriched by mines of lead and iron; but the chief mineral wealth is in the great coal-fields farther east between the Tyne and the Tees. Fireclay, limestone, and salt are also obtained in large quantities. In the eastern and central parts are fair and fertile valleys, agreeably varied with hill, dale, arable and pasture land. The total area of the county is 647,486 acres, of which about two-thirds are under cultivation. Of the cultivated area about 16 per cent is under corn crops, about 8 per cent under green crops, whilst some 36 per cent is in permanent pasture. The chief corn crops are oats and barley; the chief green crops turnips and potatoes. The cattle are abundant, and are justly esteemed both for the dairy and for fattening; the sheep are generally large, and with long wool. Coal is raised in Durham to a greater amount than in any other English county. Besides three navigable rivers, each with an important town and tolerably good harbour (Stockton, Sunderland, and South Shields) at its mouth, the county is traversed by numerous branches of railway passing through the heart of the mineral fields, and conveying their produce either to the main lines or to the coast, where, in addition to the harbours already mentioned, Jarrow and Hartlepool furnish important outlets, Newcastle with Gateshead (the latter only in this county) furnishing another. In connection with the industries of the county may be noticed its foundries, blast-furnaces, iron-works, potteries, glass-houses, iron ship-building, engine and machine-works, chemical works, and linen and woollen manufactures. The county consists politically of eight divisions, each of which sends one member to the House of Commons. Durham city is the capital. Pop. in 1871, 685,089; in 1881, 867,586; in 1891, 1,016,559; in 1901, 1,187,824.

DURHAM (originally *Dunholme*), an ancient and celebrated city and parliamentary borough in England, capital of the county of the same name, situated

on the river Wear, about 280 miles north by west of London. It stands on seven eminences, along the summits of which the most of the streets run. The houses are built some of stone some of brick, and many of them are very old and extremely irregular in form and dimensions. The principal public buildings, exclusive of the ancient castle, the cathedral, and other churches, are the town-hall, a handsome edifice in the Tudor baronial style; the county offices, the police court, the county prison, and the grammar-school. The educational institutions comprise the university, the grammar-school, the diocesan training-school for school-mistresses, blue-coat, and other schools. There are in the city an atheneum, an infirmary, and a number of minor charities. The only manufactures of any importance carried on are those of carpeting and mustard, for the last of which articles Durham has been for a long time celebrated. The vicinity abounds in beautiful public walks commanding a great extent and variety of picturesque scenery. But the great attractions of Durham are its famous cathedral and ancient castle. The former occupies the summit of a peninsula overlooking the Wear on the east and west, and having rapid descents to the river, which are covered with hanging woods and gardens. The aspect of this venerable structure is peculiarly grand and impressive. The general character of the larger portion is Norman, of a very bold style, with insertions in all the English styles. Three magnificent and elaborately ornamented towers spring up from the body of the building, one from the centre, 212 feet high, and two together from the west end, each 143 feet high. The entire length of the edifice is 420 feet. It was founded by William de St. Carilef, assisted by Malcolm, king of Scotland, in 1093. The castle, formerly the residence of the bishops, and now forming part of the buildings of the University of Durham, stands to the north of the cathedral, on the summit of an artificial mound. It is believed to have been founded by William the Conqueror, but the greater portion of the existing building is supposed to have been erected in 1350. Joseph Butler, author of the famous Analogy, was Bishop of Durham from 1750 till his death in 1752. Durham returns one member to Parliament. Pop. of mun. bor. (1881), 14,932; of parl. bor., 15,372; (1891), 14,863 and 15,287; (1901), 14,641 and 14,935.

DURHAM, UNIVERSITY OF, a university which originated in 1831 under Bishop Van Mildert, by the appropriation of part of the property belonging to the cathedral chapter. In 1832 an act of Parliament was obtained sanctioning the erection of the proposed university, in 1833 the university was opened, and in 1837 it was incorporated by royal charter. In 1841 the office of warden was permanently annexed to the deanery of Durham; a canonry in the cathedral was annexed to each of the professors of divinity and Greek; a professor of mathematics and astronomy appointed, and eighteen fellowships were founded, besides six which had previously been founded by the dean and chapter. As at Oxford and Cambridge, the students mostly reside within the university buildings, accommodation being provided for them in University College, and in Bishop Hatfield's Hall. The necessity of residing in any college, hall, or house connected with the university is not absolute, however, non-resident students being admitted under certain conditions. The ordinary management of the university is intrusted, under the Bishop of Durham as visitor, to the Dean and Chapter of the cathedral as governors, and to the warden, senate, and convocation. The degrees conferred are much the same as those granted by other uni-

versities, and since 1895 all except those in divinity may be conferred on women. They include the degrees of Bachelor and Master of Arts, Bachelor and Doctor of Literature, of Science, and of Divinity; the usual medical degrees, degrees in music, and the degree of Doctor of Civil Law. The academical year is divided into three terms—Michaelmas, Epiphany, and Easter. For the degree of B.A., B.Litt., or a license in theology, the candidate must (in the regular course) be in residence for six terms (or two years of twenty-six weeks' residence each), and must of course pass the necessary examinations. A B.A. when of the standing of nine terms from admission to his degree may receive the degree of M.A. without examination if he had obtained honours on taking his degree. For the degree of B.D., candidates must be in priest's orders, and not less than twenty-seven years of age, and any B.A. or licentiate in theology may obtain it by examination if he is of at least four years' standing. No religious test is required from any member of the university unless he is a student in the faculty of theology. Science was taught from the first, but not to a satisfactory extent till 1871, when the Durham College of Science was instituted in connection with the university at Newcastle-upon-Tyne. The medical department of the university is constituted by the Durham University College of Medicine, founded in 1851 at Newcastle, an institution which has greatly increased in efficiency in recent years by the establishment of additional chairs. In 1891 the degrees of Bachelor and Doctor in Hygiene were instituted.

DURIAN, or **DURION** (*Durio ribesinus*), a fruit-tree of the natural order Sterculiaceae, pretty generally diffused over the south-east of Asia, and esteemed by those accustomed to it for the delicious flavour of its fruit. The fruit is, however, on a first acquaintance, revolting from its strong smell, which is said to arise from sulphuretted hydrogen. The tree is about the size and somewhat in the form of a pear-tree; but the leaves are shaped like those of the cherry, except that they are entire and smooth at the edges. The flowers are large and of a yellowish white. The fruit also is large (in some of the species as large as a man's head), and externally it is not unlike the bread-fruit. It has a hard rind, covered with warts and tubercles. When ripe it becomes of a brownish-yellow, and opens at the top. It must then be eaten fresh from the tree, as it putrefies in less than twenty-four hours. The fruit contains five large longitudinal cells, each containing one to four seeds about the size of pigeons' eggs, embedded in pulp, which is the delicious part of the fruit.

DÜRKHEIM, or **DÜRKHEIM AN DER HARDT**, a town of Bavaria, in the Palatinate, 14 miles s.w. of Mannheim. It is well built, possesses a Roman Catholic and two Protestant churches, paper-mills, an oil-mill, &c. Its annual sausage market, founded in 1494, is attended by large numbers of people. Dürkheim has saline mineral springs, in the water of which Bunsen and Kirchhoff by spectrum analysis first detected the metals rubidium and cesium in 1860. Dürkheim was early walled and fortified, so as to possess considerable strength, and became an object of keen contest during the Thirty Years' War. Pop. (1895), 6055.

DURLACH, a town of Baden, 4 miles s.e. of Carlsruhe, at the foot of the Turmberg. It is an ancient place, and has in its vicinity a ruined castle, which was the cradle of the reigning family of Baden. It has manufactures of iron, machinery, organs, sewing-machines, gloves, beer, &c., and is celebrated for its fruit. Pop. (1900), 11,853.

DUMRA, **DMURA**, the Egyptian name of two or

three varieties of an important food-grass, *Sorghum vulgare* (or *Andropogon Sorghum*), extensively grown, under various names (such as millet, broom-corn, Kaffir corn, sorghum, &c.), in many of the warmer parts of the world, including Southern Europe, parts of Africa, Asia Minor, India. See **SORGHUM** and **MILLET**.

DURRA, another name of Seistan Lake (which see).

DÜRRENSTEIN, a village in Lower Austria, picturesquely situated on the left bank of the Danube, 41 miles west by north of Vienna. It is celebrated for its feudal castle, the ruins of which occupy the summit of a lofty and precipitous rock. In this castle Richard Cœur-de-Lion was treacherously detained on his return from Palestine in 1192 by Duke Leopold of Austria. It was destroyed by the Swedes in 1645. In November, 1805, the French here defeated the Austrians and Russians.

DURUY, **VICTOR**, French historian and statesman, was born at Paris of poor parents on Sept. 11, 1811. In 1830 he entered the École Normale Supérieure, where he remained for three years, after which he taught history for a short period in the college at Rheims. He returned to Paris to take up the professorship of history in the Collège (afterwards Lycée) Henri IV, a post which he occupied till 1861. In 1862 he was appointed inspector-general of public instruction and professor at the École Polytechnique, and in the following year Napoleon III. made him minister of public instruction. During his six years' tenure of this office he carried out many important reforms in spite of the determined opposition of the clerical party, and on resigning his office in 1869 he was nominated a member of the senate. He was elected a member of the Academy of Inscriptions in 1878, and in 1884 a member of the French Academy. He died in Paris on Nov. 25, 1894. Besides many excellent school manuals, he wrote: *Histoire des Romains depuis les Temps les plus Reculés jusqu'à L'Invasion des Barbares* (7 vols., 1870-79), his most important work; *Histoire des Grecs depuis les Temps les plus Reculés jusqu'à la Réduction de la Grèce en Province Romaine* (2 vols., 1862), crowned by the Academy; *Histoire de France* (2 vols., 1859); *Introduction Générale à L'Histoire de France* (1865); and other works. He was general editor of Hachette's Great *Histoire Universelle*.

DUSSELDORF, a town in Prussia, capital of the government of the same name, in the Rhenish province, beautifully situated among villas and gardens on the right bank of the Rhine, here crossed by a bridge of boats, at the confluence of the Düssel, and on the railway from Elberfeld, 22 miles s.w. of Cologne. It consists of the old town in the north, Karstadt, the new town, and Friedrichstadt in the south, with the suburbs Derendorf, Flingern, Oberbilk, Unterbilk, &c. So many improvements have been made upon it within the present century that it has almost entirely a modern aspect, and ranks as one of the handsomest towns in the valley of the Rhine, with fine promenades and pleasure-grounds, partly replacing older fortifications, and spacious streets in many cases planted with trees. The chief public squares are the Corneliussplatz, with a fountain and a statue of Cornelius; Schadowplatz, with a monument of Schadow; the market-place, with an equestrian statue of the Elector Johann Wilhelm; and the Burgplatz, with the tower of the castle which was founded in 1710 and burned down in 1872. In 1896 a bronze equestrian statue of the Emperor William I. was unveiled. The principal churches, of which there are 12 Roman Catholic and 8 Protestant, are St. Lambert's church, a 14th-

century building, near the Rhine, adorned with marble monuments of Wilhelm IV. and Johann Wilhelm, the last two Dukes of Cleves and Berg; St. Andrew's church, completed 1629, a former Jesuit church; the Franciscan convent, with a fine bronze altar-table; and the Protestant church of St. John. The other buildings include the Academy, a modern building in the Renaissance style; the court-house, with Schadow's last oil-paintings; the theatre; the post-office; the Imperial Bank building; the real-school; and the town-house, in the market-place, a building of the 16th century, with fine paintings. Among the public institutions particular notice is due to the Academy of Art, founded, 1767, by the Elector Theodore, remodelled in 1821, and afterwards directed by Cornelius and Schadow. It has the honour of having founded a school of painting, which takes the name of Düsseldorf. There is an exhibition of modern pictures in the Art Hall, opened in 1881, and there are some paintings by the old masters, besides drawings, engravings, water-colours, &c., in the old palace. The Hofgarten is a magnificent public garden extending eastwards from the Rhine; and there are also a zoological garden, a Floragarten, &c. Düsseldorf carries on the cotton manufacture, iron-founding, brewing, and many other industries, and its trade as a port and the centre of several railways is large and increasing. After being the capital of the duchy of Juliers and Berg, Düsseldorf passed under the rule of the counts palatine of Neuberg, and then became the residence of the Elector-palatine John William, under whom it enjoyed great prosperity and became a centre of artistic work. It was taken by the French in 1795, restored to Bavaria by the Treaty of Lunéville in 1801; in 1806 became the capital of the grand-duchy of Berg, with which it passed to Prussia in 1814. Pop. in 1895, 175,985; in 1900, 213,767.—Pop. of the government (1900), 2,599,806.

DUTCH AUCTION, a kind of auction in which articles are put up for sale at a price above their real value, and above the value at which they are expected to be sold, and the price is lowered until a bid is made for the articles.

DUTCH GOLD. See **DUTCH METAL**.

DUTCH LANGUAGE, &c. See **NETHERLANDS**.

DUTCH LIQUID ($C_2H_2Cl_4$), an oily fluid first prepared by Dutch chemists by causing chlorine gas and olefant gas to combine. It may be used as an anæsthetic.

DUTCH METAL, **DUTCH GOLD**, or **DUTCH LEAF**, an alloy containing 84·5–84·7 p. ct. of copper and 15·5–15·3 p. ct. of zinc, with a fine golden-yellow colour, ductile, malleable, and tenacious. When beaten out by a process analogous to that for gold-leaf, until the sheets are less than 1–50,000th part of an inch thick, it constitutes Dutch leaf or Dutch foil, and is used instead of gold-leaf for ornamental purposes. As it dissolves in nitric acid it is readily distinguished from true gold-leaf. The scraps and parings from Dutch leaf are utilized by grinding them with oil or honey, or some convenient medium, and thus they constitute bronze powders.

DUTCH PINK, a bright-yellow colour used in distemper, for staining paper-hangings, and for other ordinary purposes.

DUTCH RUSH, a name given to several species of *Equisetum*, especially *E. Arvense*. See **EQUISETUM**.

DUTTEAH, **DATTIA**, or **DATIA**, a town in Hindustan, capital of a state of the same name, in the Bundelkhand Agency, on the route from Agra to Saugor, 110 miles s. by s. Agra. It consists of narrow, winding streets, in which, however, many of the houses are large and substantial. The rajah's palace is situated within a large ground of about

10 acres, inclosed by a lofty wall, with embattled towers at each of its four corners. Pop. (1891), 27,566.

DVINA, NORTHERN, a river in Russia, formed in the government Vologda by the junction of the Suchona and the Jug; flows north for about 43 miles, and receives the Vitchegda on the right, after which it flows south-west and falls into the White Sea 45 miles below Archangel, by several mouths, which form a number of islands. The length from the source of the Vitchegda is about 1100 miles. By means of canals connecting the Suchona with the Neva, and the Vitchegda with the Kama, a navigable communication is opened between the White Sea, the Baltic, the Black Sea, and the Caspian.

DVINA, WESTERN. See **DUNA**.

DWALE, a name of the deadly nightshade. See **NIGHTSHADE**.

DWARF, a person whose stature is much smaller than that of persons in general. The term is somewhat vague, as we cannot say how small a person must be to be so called. Accounts of dwarf tribes have been common from early times, such tribes being located especially in Africa; and from the accounts of Du Chaillu, Schweinfurth, Stanley, and other travellers, it is known that there are several dwarfish tribes throughout this continent. The Obongo, a race of dwarfs, are described as living in woods near the Okanda river, in wretched huts made of branches. Other races are the Mabongo, and the Akka dwarfs of Central Africa (see **AKKAS** in **SUPP.**); and a race is said to exist in the Congo States, mixed with other tribes. The Romans employed dwarfs for several purposes; sometimes in gladiatorial exhibitions, on account of the ridiculous contrast which they afforded to their opponents. Towards the end of the middle ages, and even in some countries as late as the beginning of the eighteenth century, dwarfs were a fashionable appendage to the courts of European princes and the families of the nobles. They sometimes acted as jesters. Peter the Great assembled dwarfs from all parts of his empire, and ordered the famous marriage of the dwarfs. At the present day dwarfs are often exhibited as natural curiosities. Amongst the most celebrated dwarfs, the following may be mentioned:—Jeffrey Hudson, the favourite dwarf of Charles I, who at the age of thirty is said to have been only 18 inches high, though he afterwards grew to 3 feet 9 inches; Count Boruslavski, a Polish gentleman, who died in 1837: his height at twenty-five was 35 inches, and he was a man of considerable intelligence and accomplishments, author of memoirs, which were published in London in 1788; Bébé, the celebrated dwarf of Stanislas of Poland, whose height was 33 inches; Charles H. Stratton 'General Tom Thumb', 81 inches high at the age of 25; Francis Flynn, 'General Mite', 21 inches at sixteen.

DWARFED TREES, a favourite ornament for dwellings among the Japanese and Chinese, who adopt a peculiar method of dwarfing. They choose some fruit- or flower-bearing branch of any tree of which they wish to produce a dwarf specimen, and cutting off a ring of the bark, surround the stripped part with clay, which they keep moist by means of a covering of moss, which is watered when it becomes dry. After a period, varying in different trees from about three months to two years, roots are sent out by the branch into the clay. The branch is then cut off below these artificial roots, and planted in a poor soil, where it is kept scantily supplied with water. In this state the tree will remain for years, with vitality enough to produce leaves and even flowers annually, but never producing any but abortive shoots.

Another method is to plant trees in flower-pots with a shallow covering of soil, supplying them, as in the former case, very sparingly with water, and pinching off all the strongest shoots.

DWIGHT, TIMOTHY, American divine, was born at Northampton, Massachusetts, May 14, 1752. In 1769 he graduated at Yale College, and in 1771 became a tutor there. In 1777 he was licensed as a preacher, and for about five years preached to different congregations in the neighbourhood of Northampton. In 1788 he was ordained as minister at Fairfield, in Connecticut, where he opened an academy. In 1787 the College of Princeton, New Jersey, conferred upon him the degree of D.D. In 1795 Dr. Dwight was elected president of Yale College, and he also held the professorship of theology. He died at New Haven on January 11, 1817. His chief works are *Theology Explained and Defended*, in a Series of Sermons (five vols., 1818, often reprinted); and *Travels in New England and New York* (four vols., 1821). A grandson of his, also named Timothy, has distinguished himself as a theologian, and after being Professor of Sacred Literature at Yale, became president of that university in 1886.

DYAKS. See BORNEO.

DYCE, ALEXANDER, a well-known antiquarian writer and commentator on Shakspeare, was born at Edinburgh on June 30, 1798, and died on May 15, 1869. He was the son of Lieutenant-general Alexander Dyce, was educated first at the High School of Edinburgh, afterwards at Exeter College, Oxford; and, taking orders, acted as curate, first at Llanteglos, in Cornwall, and then at Nayland, in Suffolk, till 1827, when he settled in London, where the most of his life was passed. He was first brought into notice by his *Specimens of the British Poetesses* (1825), which was followed by editions of the poetical and dramatic works of Collins (1827), George Peele (1828), Webster (1830), Robert Greene (1831), Middleton (1840), Beaumont and Fletcher (1843-46), Marlowe (1850), Shirley (1833), Skelton (1843), Wotton, and Drayton, all of which were accompanied by notes and biographies of the authors. He also prepared for Pickering's collection, called the *Aldine Poets*, editions of the works of Pope, Collins, Brattie, and Akenside, and for the Shakspeare Society the old tragedies of Timon and Sir Thomas More. In 1840 he founded, in conjunction with Collier, Halliwell, and Wright, the Percy Society, for the publication of ancient comedies and ballads. His chief labours, however, were devoted to Shakspeare, an edition of whose works he published in six vols. (London, 1857; second edition, greatly improved, nine vols., 1864-67). In his *Remarks on Collier's and Knight's Editions of Shakspeare* (London, 1844) he pointed out several errors into which the modern commentators on Shakspeare had fallen; and in another work, entitled *A few Notes on Shakspeare* (London, 1853), he pronounced very strongly against the emendations of the text of Shakspeare published by Collier, and maintained by him to belong to the first half of the seventeenth century. The last work he was engaged on was an edition of Ford's works, which was published in three vols. only a month before his death.

DYCE, WILLIAM, painter, was born at Aberdeen on Sept. 19, 1806, and died at Streatham on Feb. 14, 1864. He was the son of William Dyce, M.D., a medical man of good standing. He graduated as M.A. at Marischal College, Aberdeen, in 1822, and some time after commenced his art studies in the Royal Academy. He made two visits to Rome to extend his studies, and in 1830 he settled at Edinburgh, where he soon became known as a portrait-painter and as a distinguished contributor to the

exhibition of the Royal Scottish Academy. In 1827 he had exhibited at the Royal Academy his *Bacchus nursed by the Nymphs*. About 1837 he settled in London. In 1836 he exhibited *The Descent of Venus*, the subject of which was taken from Ben Jonson's *Triumph of Love*; and in 1839, *St. Dunstan separating Edwy and Elgiva*. In 1842 he was appointed superintendent and secretary of the art schools in connection with the Board of Trade, but he resigned this office in 1844. In the latter year he was appointed professor of the fine arts in King's College, London. When the decoration of the interior of the new houses of Parliament was made a subject of competition Dyce exhibited his talents in a new light, namely, as a painter in fresco. His first fresco, *The Consecration of Archbishop Parker*, was executed in Lambeth Palace, and was followed by *The Baptism of Ethelbert*, in the House of Lords (1846). In 1848 he was commissioned to paint a series of seven frescoes in the House of Lords, but he only lived to complete five. Dyce was made a Royal Academician in 1848. Among his other pictures are: *Joshua Shooting the Arrow of Deliverance* (1844), *Virgin and Child* (1846), *Omnia Vanitas* (1849), *Meeting of Jacob and Rachel* (1850), *King Lear and the Fool in the Storm* (1851), and *John Leading Home the Virgin* (1860).

DYEING.—The origin of the art of dyeing is lost in the mists of antiquity. Like spinning and weaving it was originally a home industry practised only by the women of the household, who sought to ornament the fabrics they had made by staining them with the juices of fruits, or with infusions of leaves, barks, &c. In due time pale and fugitive colours were rendered deeper and more permanent by steeping the dyed materials in special kinds of mud containing iron or alumina, as we find still practised among certain savage tribes to-day. The home dyeing industry still met with in the remote highland districts of Great Britain is surely a survival of this primitive state of things. Historical evidence points to India as the country where, already at a very early period, the arts of dyeing and printing had attained a considerable degree of perfection. The Hindu products and processes gradually came to Egypt and eventually to western Europe, more particularly during the later years of the eighteenth century, through the agency of various officials and travellers connected with the British and French East India Companies.

Fifty years ago natural dye-stuffs alone were employed by the dyer, but already in the year 1834 the German chemist Runge had noticed that one of the products distilled from coal-tar, namely aniline, gave a bright-blue coloration when treated with chloride of lime. This early observation, however, did not lead to any practical result, but in the year 1856 the English chemist Perkin, while endeavouring to make artificial quinine, accidentally discovered a simple method of making the rich purple colouring matter *mauve*, and indeed from this same coal-tar product aniline. Other chemists soon discovered how to derive from aniline quite a number of colours: red, blue, purple, green, &c. Since that time the attention of an ever-increasing army of chemists has been devoted to the study of coal-tar products and the colours derived therefrom. Aniline, naphthalene, anthracene, and other products yield distinct series of colouring matters, so that coal-tar has now become the chief source of the dye-stuffs at present employed. The vegetable dye-stuffs are gradually being superseded by the newer colours, very many of which are entirely satisfactory as regards fastness to light and other influences.

Dyeing is the art of colouring textile and other

materials in such a manner that the colours are more or less permanent, and not readily affected by those agencies to which they are ordinarily exposed, for example, light, washing, &c. Before dyeing, the textile materials have to be cleansed or bleached in order to ensure regularity and purity of colour. Cotton and linen are bleached by first boiling for several hours with dilute alkaline solutions in order to remove fatty, pectic, and other matters. Then follow successive steepings in dilute solutions of bleaching-powder (chloride of lime) and sulphuric acid, each operation being followed by a thorough washing with water. In this manner all traces of colouring matter and other impurities are effectually oxidized and destroyed. Wool undergoes a much milder cleansing process than cotton, known as *scouring*. It consists in washing the material with warm water containing soap or carbonate of soda, and finally with water only. In the case of unspun wool in its natural condition the operation effectually removes the peculiar fatty impurity known as *yolk* and other foreign matter; in the case of woollen yarn and cloth the scouring removes the oil introduced into the wool by the spinner. Silk is scoured much in the same way as wool, but with this difference, that soap solutions only are used, and that finally the material is even boiled with soap. By this treatment the silk, which in its raw condition is a dull stiff fibre, acquires a remarkable lustre and softness. Sometimes both wool and silk require to be bleached, and this is effected after the scouring operation by submitting them, while in a moist condition, in closed chambers, to the action of the fumes (sulphurous acid) of burning sulphur, or they are steeped in cold alkaline solutions of hydrogen peroxide.

Frequently the textile material is subjected to various subsidiary treatments in order to obtain certain special effects. For example, wool may be rinsed successively in dilute solutions of chlorine and alkali, in order to render it unshrinkable, through the removal of the microscopic surface-scales of the fibres; cotton yarn or calico may be subjected to the action of strong caustic soda ('mercerizing' process) while in a state of great tension, in order to give it a permanent silky lustre. These and other chemical treatments greatly modify the behaviour of the fibres towards dye-stuffs, usually causing them to dye much more readily.

In all the operations of the dyer it is very desirable to use clear soft water. Hard water containing lime, iron, &c., causes serious defects, for example, dull and irregular colours, loss of dye-stuff, &c. Hence it has become the custom of dyers to purify and soften hard water by a treatment with quicklime and caustic soda, and then filtering or settling in tanks or reservoirs.

Dyeing has been described as an art, but it is also a branch of applied chemistry, and in its practice the dyer makes use of certain chemical and physical affinities which exist between the fibre and the dye-stuff applied to it. One fundamental principle to be observed is, that the colouring matter and all other necessary agents must be applied in a state of solution, and while in direct contact with the fibre they must be rendered insoluble, so that they are precipitated within or upon the fibre and thus permanently fixed. The method of effecting this varies greatly according to the fibre and the colouring matter employed. As a rule the vegetable and the animal fibres are dyed by very different methods. In many cases, with the animal fibres particularly, their affinity for certain colouring matters is so great that they are readily dyed by simple immersion in hot colour solutions. Such colouring matters appear

to unite with the substance of the fibres themselves to form insoluble coloured compounds, and so they become fixed within the fibre. In other cases the union between fibre and colouring matter is of a less intimate character. Two theories have consequently been advanced in order to explain the phenomena of dyeing. According to the chemical theory the colouring matter on a dyed fibre is in a state of chemical combination with the fibre itself; according to the mechanical theory the attraction between the two is entirely of a physical character. No single theory, however, is sufficient to explain all cases of dyeing.

The general character and properties of each dye-stuff are dependent upon its chemical constitution, that is, upon the relative arrangement of the atoms of which it is composed. The chemist has been able to determine the constitution of most of the colouring matters in use, and has accordingly arranged them in groups or classes, in which the members of the same group have a similar atomic arrangement; thus he speaks of the nitro colours, azo colours, oxy-ketone colours, &c. Another system of classification, however, is that in which the colouring matters are arranged according to the method of their application in dyeing. This simpler arrangement is better suited to the needs of the practical dyer, and is therefore adopted for this article. In accordance with this method the following groups may be distinguished: *Acid Colours*, *Basic Colours*, *Direct Colours*, *Developed Colours*, *Mordant Colours*, *Miscellaneous Colours*.

The *Acid Colours* are so called because they are of an acid character and are applied in an acid dye-bath. As a rule, they are only suitable for dyeing the animal fibres, e.g. wool and silk, also leather, horn, feathers, &c., but not the vegetable fibres. Some, however, can be employed in dyeing jute, straw, chip, and paper. After dissolving the colouring matter in water, the solution is very slightly acidulated by adding a little sulphuric, or in some cases acetic acid. A small quantity of sulphate of soda is usually added to ensure a *level dye*, that is, a uniform distribution of the colour. The material to be dyed is introduced into the cold or tepid solution, the temperature of which is gradually raised to the boiling point, the whole operation lasting 1 to 1½ hour. Only a few vegetable dye-stuffs belong to this class, for example, the purple colour *Orohil* and the blue colour *Indigo Extract*. On the other hand, the *Acid Colours* derived from coal-tar are very numerous and yield a great variety of hue. *Reds* are dyed with Acid Magenta, Azo Carmine, Biebrich Scarlet, Fast Red, Azo Fuchsine, Chromotrope Red, &c. Brilliant but fugitive *Pinks* are dyed with Eosine, Phloxine, Cyanosine, Rhodamine, &c., with which acetic acid must be used. *Orange* and *Yellow* colours are dyed with: Naphthol Yellow, Tartrazine, Fast Yellow, Azo Flavin, Orange G., Crocein Orange, &c. *Bright Greens* are dyed with: Acid Green, Guinea Green, Fast Green, &c. *Blues* are dyed with: Soluble Blue, Patent Blue, Thiochrome, Induline, &c. *Violets* are dyed with: Acid Violet, Formyl Violet, Violamine, &c. *Browns* are dyed with: Acid Brown, Naphthylamine Brown, Resorcin Brown, &c. *Blacks* are dyed with Naphthol Black, Naphthylamine Black, Anthracite Black, Victoria Black, &c.

The *Basic Colours* are so called because their essential constituents, to which they owe their dyeing power, are organic bases. The bases themselves are colourless and too insoluble in water to be of use, hence they are employed in the form of their soluble coloured salts, usually the hydrochlorides of the colour-bases. Their solutions are precipitated

by tannic acid, because it combines with the colour-bases to form insoluble tannates. Under suitable conditions the fatty-acids act in a similar manner. Wool, silk, and animal substances generally, behave towards them very like tannic acid; they too have a direct attraction for the colour-bases, and hence these fibres are readily dyed by simple immersion in hot aqueous solutions of the Basic Colours. During the dyeing process the soluble colour-salt is decomposed, the colourless base combines with the fibre itself to form, as it were, an insoluble coloured salt, in which the fibre plays the part of an acid, while the hydrochloric or other acid of the colour remains in solution. The vegetable fibres cotton and linen, on the other hand, are not dyed so readily, since they have no attraction for the colour-bases. They need first to be prepared or impregnated with tannic acid, by steeping for 1 to 2 hours in a cold solution of this substance, or in a cold infusion of some tannin matter, e.g. sumach, myrabolams, &c. Thus prepared the cotton is said to be *mordanted*, the tannic acid in this connection being styled the *mordant*. Although a natural attraction exists between the cotton and tannic acid, the latter needs to be still more permanently fixed, by passing the prepared or mordanted fibre into a cold solution of tartar-emetic (antimony salt), whereby it is precipitated within the fibre as very insoluble tannate of antimony. Only after these mordanting and fixing operations is the cotton or linen ready to be dyed with the Basic Colours, the operation of dyeing being then the same as with wool. Jute is dyed direct, without the necessity of mordanting, for it behaves like tannin-prepared cotton. Most of the colours of this class, sometimes also called the *Tannin Colours*, are fugitive to light, only certain dark-blues being tolerably fast in this respect. Among the vegetable dye-stuffs there is but one belonging to this class of Basic Colours, viz. *barberry root*. Although of minor importance it is still used in the dyeing of leather and silk, to which it imparts a bright-yellow colour. The following list includes some of the principal coal-tar colours of this class:—*Reds*: Magenta, Rhodamine, Safranin, Pyronine. *Oranges and Yellows*: Auramine, Phosphine, Chrysoidine, Benzoflavine, Acridine Orange, Thioflavine. *Greens*: Malachite Green, Brilliant Green, Azine Green, Methylene Green. *Blues*: Aniline Blue, Victoria Blue, Methylene Blue, Meldola Blue, Nile Blue, Capri Blue, Indazine Blue, Metaphenylene Blue, Induline, Indoan Blue. *Violets and Purples*: Mauve, Hofmann's Violet, Methyl Violet, Ethyl Purple, Paraphenylene Violet. *Browns*: Bismarck Brown. *Grays*: Nigrisine, Methylene Gray. *Blacks*: Fast Black, Jute Black.

The *Direct Colours* are so called because they have the characteristic property of dyeing cotton direct, that is, without the aid of any mordanting process so necessary with the Basic Colours. Other names given to this class are: *Direct Cotton Colours*, *Congo Colours*, *Benzidine Colours*, *Benzo Colours*, *Diamine Colours*. The first member of this class derived from coal-tar was Congo Red, discovered in 1884. The dyed colour was fugitive to light and extremely sensitive to the action of acids, which at once turned it blue. At the present time, however, this group includes a very great variety of colours fast to these and other influences; and it forms, indeed, one of the most important and valuable series of dye-stuffs employed. Cotton, linen, and the vegetable fibres generally are dyed in the simplest possible manner by merely boiling them in a solution of the dye-stuff, with or without the addition of a little soap, carbonate or sulphate of soda, &c. With some colours acetic acid is a better addition. These

assistants render the colour brighter or more intense. Wool and silk are frequently dyed in the same manner as cotton, but in many cases the colours are applied to these fibres after the manner of Acid Colours. Applied to these fibres the Direct Colours are usually fast to milling and washing, whereas on cotton they are not fast in this respect. By selecting suitable dye-stuffs of this class it is possible to dye mixed fabrics composed of two fibres a uniform colour, a fact which has been largely made use of in dyeing materials containing both cotton and wool. Very few vegetable dye-stuffs belong to this class of Direct Colours, e.g. *Safflower*, *Turmeric*, *Saffron*, *Annatto*. They are all fugitive, and are now of little or no importance to the dyer. *Safflower* is a bright-pink dye-stuff formerly much used for dyeing tape. The colour was extracted by means of carbonate of soda, and after acidifying with citric acid, the material was dyed at once in the cold solution. *Turmeric* is a bright-yellow dye-stuff which dyes both wool, cotton, and silk in an acidified decoction of the colouring matter. *Saffron* is also a bright-yellow dye-stuff applied by dyeing in a hot decoction, without any addition. *Annatto* is a bright-orange dye-stuff similarly applied with a slight addition of soap to the bath. So numerous are the members of this class among the coal-tar colours that only a few names can be given in the following list, many equally important colours being omitted. *Reds*: Benzopurpurine, Diamine Scarlet, Rosazurin, Erica. *Oranges and Yellows*: Tolylene Orange, Mikado Orange, Chrysaline, Brilliant Yellow, Chrysophenine, Hessian Yellow, Curcumin. *Greens*: Benzo Olive, Diamine Green. *Blues*: Benzo Azurine, Sulphonazurine, Diamine Blue, Benzo Indigo Blue. *Violets*: Heliotrope, Diamine Violet, Hessian Violet, Azo Violet. *Browns*: Cachou de Laval, Benzo Brown, Congo Brown, Tolylene Brown, Diamine Brown, Cotton Brown, Mikado Brown. *Blacks*: Benzo Black, Violet Black, Diamine Black, Vidal Black.

Developed Colours.—In this group there is included a variety of colours which are formed *in situ* upon the fibre by the successive application of two or more substances. The group may be conveniently divided into the following sub-groups: *Insoluble Azo Colours*, *Primuline Colours*, *Developed Direct Colours*.

The *Insoluble Azo Colours* are produced as coloured precipitates upon the material (cotton) by first impregnating it with an alkaline solution of a so-called phenolic substance, e.g. naphthol, and then, after drying, passing it into a cold solution of an azo compound. The latter substance is prepared by the action of nitrous acid upon a solution of an amido substance, e.g. aniline. By varying the phenolic and amido substance in this process quite a variety of useful colours may be dyed, e.g. red, crimson, orange, chocolate, blue, and black. A very well known member of this group is the so-called Paranitriline Red obtained by the use of β -naphthol and paranitriline. Owing to its extreme brilliancy this colour is used as a substitute for Turkey red, although it is by no means so fast to light. If in conjunction with the β -naphthol metanitriline is employed instead of paranitriline a yellowish-orange colour is obtained in place of red, with nitro-toluidine a reddish-orange, with amidoazotoluene a reddish-chocolate, with benzidine a dark-chocolate, with dianilidine a dark-blue, with α -naphthylamine a bright claret-red, and so on. All these colours are fairly fast to washing and to light.

The *Primuline Colours* (also called Ingrain Colours) form a small group of colours derived from the yellow dye-stuff Primuline, which dyes cotton direct. If

the yellow-dyed material is passed into a cold solution of nitrous acid, obtained by adding hydrochloric acid to a solution of sodium nitrite, the yellow primuline dye, being an amido substance, is converted into an orange-coloured azo compound. If, after washing, the material is at once passed into the solution of various phenolic or amido substances, a variety of colours are produced or developed. In practice the operation of passing the fabric into the nitrous-acid solution is called the 'diazotising' process, and the various phenolic and amido substances are called 'developers'. The employment of β -naphthol develops a red (Primuline Red), phenol develops a yellow, resorcinol an orange, naphthylamine a purple, meta-phenylenediamine a brown, and so on. All these colours, especially the red, are moderately fast to washing, and are much used for dyeing cotton.

The *Developed Direct Colours* are obtained in a manner precisely similar to that just described. Cotton is dyed with one of the Direct Colours having an amido character, the dyed cotton is passed into nitrous-acid solution in order to convert the colour on the fibre into an azo compound, and then, after washing, the material is passed into the solution of some developer. The original Direct Colour, which is not fast to washing, is thus converted into a new and distinct colour which is fast. The following Direct Colours, for example, may be usefully employed in this manner: Diamine Black, Diamine Brown, Diamine Blue, Diamine Cutch, Diaminogen. The change of colour by the process is not so striking with these colours as with Primuline, the original colour usually becoming darker or even black, or changing from purple to brown.

Mordant Colours.—These form one of the most important classes of colouring matters, for they include not only most of the vegetable dye-stuffs, *e.g.* madder, logwood, fustic, &c., but also many valuable fast coal-tar colours, commonly known as the Alizarin Colours, after their typical representative, Alizarin. These Mordant Colours have by themselves very little colouring power, as a rule, and if employed alone in dyeing they give little or no result, a mere loose stain. If applied, however, in conjunction with metallic salts, notably those of chromium, aluminium, iron, tin, and copper, they each yield a variety of colours, according to the metallic salt employed. The Mordant Colours are, indeed, or contain, certain principles of a weak acid or phenolic character, by virtue of which they have the property of combining with metals or their oxides, to produce variously-coloured precipitates or lakes. In employing them the object of the dyer is so to apply the two constituent elements of the ultimate dye, namely the metallic salt and the colouring matter, that they shall produce the coloured precipitate upon or within the material to be dyed. This usually involves two distinct operations: first, that of applying the metallic salt or mordant, and called the *mordanting process*; and second, that of *dyeing*, in which the mordanted material is boiled in a solution or decoction of the dye-stuff. During the dyeing operation the colouring principle of the dye-stuff combines with the metallic salt already upon the material, and the coloured lake is thus produced and fixed upon the fibre. The method of mordanting varies with the fibre and the metallic salt employed. Wool is mordanted with chromium by boiling it for 1 to 1½ hour with a solution containing 3 per cent of bichromate of potash (reckoned on the weight of wool). Frequently certain assistants are added to the solution to ensure good results, *e.g.* sulphuric acid, cream of tartar, lactic acid, &c. Aluminium is applied in the form of alum, or aluminium sulphate (10 per cent),

with the addition of cream of tartar (9 per cent). Ferrous sulphate and stannous chloride require the addition of oxalic acid or cream of tartar. Copper sulphate may be used without addition. The success and efficacy of the mordanting of wool depends upon the property which this fibre possesses of decomposing metallic salts when it is boiled in their solutions, and depositing within itself insoluble metallic compounds (basic salts) in which probably the substance of the fibre itself is a constituent element. Silk is capable of being mordanted like wool in many cases; it is, however, frequently treated in the same manner as cotton. It may be steeped in cold metallic salt solutions, *e.g.* alum, chromium chloride, basic ferric sulphate, &c., and, subsequent to washing, passed into a cold dilute solution of silicate of soda, in order to fix in the fibre insoluble silicates of the metals. Cotton is mordanted with chromium and aluminium by first impregnating it with a solution of so-called Turkey-red oil or sulphated oil, then drying, and steeping for a short time in basic chromium chloride or aluminium acetate; to remove acidity the material is then passed through warm water containing silicate of soda or a little chalk in suspension, and finally washed. If it is desired to mordant the cotton with iron or tin, the material is steeped for two hours in a cold solution of tannic acid, then passed into a cold solution of pyrolignite of iron or stannic chloride, and finally washed. A similar preparation with tannic acid may also replace the use of sulphated oil when applying the chromium and aluminium salts. Other methods of mordanting the various fibres are in vogue to which reference cannot here be made. Speaking generally, the aluminium and tin mordants are employed in the production of the brighter colours, red, orange, yellow, &c.; the iron mordants, on the other hand, give the darker colours, *e.g.* brown, black, &c. The chromium mordants are now considered the most important of all, because they give a wide range of colour both bright and dark with the various dye-stuffs, and the colours are usually faster than when other mordants are employed. Among the vegetable dye-stuffs of this class may be mentioned the following: *Madder, Cochineal, Peachwood, Sapanwood, Limawood, Camwood, Barwood, Sanderswood, Old Fustic, Young Fustic, Quercitron Bark, Persian Berries, Weld, Logwood.* Madder was formerly the most important and highly valued of the dye-stuffs of this class. It is the ground dried root of an Indian plant, at one time largely cultivated in France and Holland. With the different mordants it gives a remarkable variety of colour, viz. red with aluminium, orange with tin, reddish-brown with chromium, purple and black with iron. All the colours are remarkably fast to light and washing. Madder and its commercial preparation *garancine* were formerly very largely employed in Turkey-red dyeing, calico-printing, and wool-dyeing. It is now entirely superseded by the coal-tar colour alizarine. *Cochineal* is a species of scale-insect living on the cactus-plant in Mexico and elsewhere. It yields a somewhat similar series of shades to madder, but its chief use is for dyeing brilliant fast scarlet on wool. The usual so-called 'single-bath' method is to mordant and dye simultaneously, viz. to boil the wool in a solution containing nitrate of tin, oxalic acid, and ground cochineal. The employment of cochineal for this purpose has, however, greatly diminished through the introduction of the cheaper azo-scarlets, which are Acid Colours not requiring the tin mordant. *Peachwood, Sapanwood, and Limawood* consist of the ground wood of large trees growing in Central America, Peru, and the East Indies. They contain very soluble colouring principles and dye somewhat

like madder, the shades being much bluer in tone, however, and very fugitive; hence they are becoming rapidly displaced by alizarine and its allies. *Camwood*, *Barwood*, and *Sanderwood* contain colouring principles much less soluble than the last, and are the product of large trees growing in the interior of West Africa. They are almost entirely used in wool-dyeing, either in conjunction with the indigo-vat or for the purpose of dyeing various shades of brown. The wool is first boiled with a decoction of the ground wood and then dyed in the indigo-vat; for brown, after 1½ to 2 hours' boiling, there is added to the dye-bath a little bichromate of potash, or sulphate of iron or copper. In this case the dye-stuff is applied before the mordant, a method known as the 'saddening' method of dyeing, since the colour at first imparted to the wool is rendered darker or is 'saddened' by the action of the mordant. *Old Fustic* is the wood of the dyer's mulberry-tree growing in Cuba, and is the most important and most largely employed of the yellow mordant dye-stuffs, since it is cheap, and the colours are fast although not very brilliant. With chromium mordant it gives an olive-yellow, with aluminium and tin brighter yellows, with copper and iron greener and darker olive colours. It is generally used along with other dye-stuffs to obtain compound shades. *Young Fustic* consists of the branches of a shrub growing in Southern Italy. It yields fugitive colours, and is now little used. *Quercitron Bark* is the ground inner bark of an oak growing in the Southern States of North America. It is generally employed as an extract, or in the form of its commercial preparation called *Flavine*. The latter is an excellent dye-stuff employed by wool-dyers for the production of bright orange and yellow colours. It is applied, after the manner of cochineal, by the single-bath process with oxalic acid and tin mordant. *Persian Berries*, the unripe fruit of a species of buckthorn growing in the Levant, and *Weld*, a species of wild mignonette, are both excellent dye-stuffs. Their employment is, however, limited, the use of weld being mainly confined to the dyeing of a bright-yellow with alum mordant on woollen-cloth facings for military uniforms. *Logwood* is the wood of a tree growing in Central America. It is largely employed by wool, silk, and cotton dyers for dyeing black and dark-blues, which, although fast to washing, are only moderately so towards light. On wool the mordant used is chromium, on cotton and silk it is iron. Although large quantities of dyewoods are still employed they are, as previously stated, gradually being replaced by coal-tar colours. The following list includes typical representatives belonging to the class of Mordant Colours:—*Reds*: Alizarine, Anthrapurpurine, Flavopurpurine. *Oranges* and *Yellows*: Alizarine Orange, Alizarine Yellow, Galloflavine. *Greens*: Alizarine Green, Cærulein. *Blues*: Alizarine Bordeaux, Alizarine Cyanine, Alizarine Blue, Anthracene Blue. *Violets* and *Purples*: Gallein. *Browns*: Anthracene Brown. *Blacks*: Alizarine Black. Mordant dye-stuffs of a somewhat different order from the foregoing are: Cloth Red, Diamine Fast Red, Milling Yellow, Diamond Yellow, Diamond Green, Dark Green, Gambine, Diamond Black.

Miscellaneous Colours.—Under this head may be conveniently included several dye-stuffs which are applied in a distinct manner from the foregoing. *Indigo* is a valuable blue dye-stuff obtained from the leaves of an Indian shrub. It is a dark-blue powder quite insoluble in water, but which can be rendered soluble for dyeing purposes by two methods, first by a treatment with strong sulphuric acid, and secondly by submitting it to the so-called

reducing action of nascent hydrogen in the presence of alkalis. The first method converts the indigo into so-called *Indigo Extract*, which is sold as a blue paste and applied as an Acid Colour in dyeing wool and silk. In the second method the indigo-blue is converted into indigo-white, which readily dissolves in the alkali present, the solution thus obtained being called an indigo-vat. If cotton, wool, or silk is steeped for some time in the clear yellow solution of such a vat, and then exposed to the oxidizing influence of the air, they are dyed a permanent blue. The indigo-white absorbed by the fibre loses its acquired hydrogen, and thus insoluble indigo-blue is regenerated within and upon the fibre. In the *wood-vat* the reduction of the indigo is effected by fermentation, the ingredients of the vat being indigo, wood, bran, madder, lime. The wood constituting the ferment is an earthy-looking product made by grinding the leaves of the wood plant to a paste, allowing it to ferment, and then partially drying it. In the *hyposulphite-vat* the reduction is effected by chemical means, the ingredients in this case being zinc powder, bisulphite of soda, and lime. *Aniline Black* is a valuable colour, not sold in powder or paste form, as other dye-stuffs are, but produced direct upon the fibre by the oxidation of aniline. It is remarkable for its extreme permanency towards light and other agencies. Its chief employment is in connection with cotton, it is also applied to silk, but rarely to wool. Cotton may be dyed by steeping it for one or two hours in a cold solution containing aniline hydrochloride, bichromate of potash, and sulphuric acid. A black precipitate is thus gradually formed within and upon the fibre. Other methods are in vogue, in which the material is first impregnated with a solution containing aniline hydrochloride, chlorate of soda, and a salt of copper or vanadium, and then passed through specially-constructed drying and oxidizing chambers to develop the black. *Catechu* is an important brown dye-stuff made by boiling with water the wood, leaves, or fruit of various mimosa and other trees growing in India. The extract is boiled down to a pasty or solid condition. Cotton is dyed brown by first boiling it with a decoction of catechu, and then passing through a boiling solution of bichromate of potash. In the catechu bath the cotton abstracts the colouring principle catechin and acquires only a pale-cinnamon colour, which is almost immediately developed to a darker brown by the oxidizing action of the bichromate of potash in the second bath; by repeating the two operations very rich full browns are obtained. On wool, catechu yields khaki browns in single bath by using copper sulphate as the mordant. On silk catechu is largely employed for weighting purposes in the process of dyeing black. *Chrome Yellow*, *Iron Buff*, *Prussian Blue*, and *Manganese Brown*, employed in cotton dyeing, are frequently classed as Mineral Colours. *Chrome Yellow* is obtained by immersing cotton successively in solutions of acetate of lead and bichromate of potash, whereby the yellow precipitate of chromate of lead is fixed upon the fibre. *Iron Buff* is obtained in a similar manner by the successive application of sulphate of iron and carbonate of soda, and finally developing the full colour by washing with water and exposure to air. The buff colour is really due to the precipitation of oxide of iron on the cotton. *Prussian Blue* is at once developed by passing the buff-dyed cotton through an acidified solution of potassium ferrocyanide. The production of *Manganese Brown* on cotton is similar to that of iron buff, manganese chloride being used instead of ferrous sulphate, and caustic soda replacing the carbonate soda. The brown colour ultimately produced upon the fibre is an oxide of manganese.

The mineral colours are very useful for certain purposes, and are to be regarded as very fast to light.

During the last fifty years the art of dyeing has developed in a wonderful manner, through the introduction of the coal-tar colours and of special machinery, also by reason of the investigation of the chemical changes involved in the various operations. So complex, indeed, has the whole art become that in a short article like the present only the fringes of the subject can be touched, but it is hoped that enough has been stated to give some insight into this most interesting branch of applied science.

DYER, JOHN, an agreeable poet of the secondary order, was born at Aberglasney, in Carmarthenshire, in 1700, and educated at Westminster School. Being left, by the death of his father, at liberty to follow his own inclination, he became a pupil to Richardson the painter, and travelled about as an itinerant artist, but never seems to have gained any distinction in that capacity. In 1727 he made himself known as a poet by the publication of his celebrated *Grongar Hill*. The intermixture of moral reflections, introduced in an easy manner, with the description of rural scenery, has rendered this poem highly and deservedly popular. After the publication of *Grongar Hill* he went to Rome to study painting, and published in 1740 a poem in blank verse under the title of the *Ruins of Rome*. Not appearing likely to succeed in his profession, he was recommended to take orders, and was accordingly ordained by Dr. Thomas, bishop of Lincoln. He then married, and retired to a small living in Leicestershire, which he soon afterwards exchanged for another in Lincolnshire; and he subsequently held two livings in this county. In 1757 he published his largest poem, the *Fleece*, in five books, a very ingenious production. He died in 1758. His poems, which comprise a few more pieces than those already mentioned, were published in one vol. 8vo, 1761.

DYING DECLARATION, a deposition made by one who is in prospect of death. Such declarations are admitted as evidence both in England and Scotland. It is allowable for a witness to give parole evidence in a dying declaration, but more weight is attached to it when it was taken down in presence of witnesses. It is not necessary, however, to observe all the formalities which are required in the authentication of the declaration of a prisoner when a dying declaration is committed to paper. Before dying declarations can be admitted as evidence against a prisoner it is necessary to prove that the deceased person at the time of making the declaration really apprehended impending, though perhaps not immediate, dissolution. Act 30 and 31 Vict. cap. xxxv. sec. 6 and 7, contains enactments with regard to dying declarations, and makes provision, among other things, for prisoners being present when they are made.

DYKE. See DIKE.

DYKE, a term applied by geologists to masses, generally of crystalline rock, which are often found intersecting other strata in the manner of huge walls of greater or less thickness. They are very common in coal-fields, and often give very visible indication of their volcanic origin, or at least of their having once been rendered fluid by heat, and then either ejected from below or injected from above, so as to fill up fissures in the strata. A coal-seam in the vicinity of a dyke is often as completely carbonized as if it had been placed in a coke furnace. Its level also is usually changed, the seam, if continued at all on the other side of the dyke, being found either much higher or much lower than before. See MINING.

DYNAMICS, the science which investigates the action of force. Force, when it acts on matter, is recognised as acting in two ways: first, so as to compel rest, or to prevent change of motion; and secondly,

so as to cause or to change motion. Hence the science of dynamics is divided into two branches, to which the names *statics* and *kinetics* are respectively given. There is a branch, properly speaking of pure mathematics, which treats of the mere circumstances of motion without considering the forces which produce it. This subject is always considered in connection with the science of dynamics, and the name *kinematics* is given to it. Popularly it has been the custom to give to the science of force the name *mechanics*, the branch which treats of force applied so as to compel rest or prevent change of motion being called *statics*, and the branch of the science which considers force applied so as to cause or change motion being called *dynamics*, while no special name was given to that which is now called kinematics, the subject being treated under the last-mentioned head. Since this usage still exists in popular language, we have adhered to it in this work: the reader is therefore referred to the article MECHANICS for information on the science of force.

DYNAMITE, an explosive substance patented by A. Nobel in 1867. It originally consisted of a siliceous earth from Obeslohe in Hanover known as *Kieselguhr*, impregnated with 75 per cent of nitro-glycerine, the object of the mixture being to facilitate the carriage and use of that substance by diminishing its susceptibility to slight shock while not destroying its explosive force. The siliceous matter is of diatomaceous origin, it is extremely friable and porous, and has a considerable absorbent power. Dynamite is prepared in a porcelain vessel in which a mixture of 30-25 parts of the siliceous matter in the finest powder is stirred with 70-75 parts of nitro-glycerine until the mass is quite uniform and has the appearance of raw sugar. Diatomite, a substance superior to kieselguhr, is now also employed, and as siliceous powder is not easily obtained various substances have been adopted to mix with the nitro-glycerine, such as charcoal, sand, sawdust, &c. (See NITRO-GLYCERINE.) The mixture remains without change for any length of time unless exposed to water. It burns away quietly if a light is applied to it, but explodes if heated to a high temperature. It is usually exploded by a specially-arranged fulminating cap. Its disruptive effect upon tough timber, blocks of granite, and slabs of wrought iron is most intense, and is estimated at several times that of gunpowder, being besides more concentrated. For blasting operations under water it is preferred, as it requires less labour in making cavities for the charge, while it only loses part of its explosive power in water. In mining it is found to be too shattering in its effects.

DYNAMO, or DYNAMO-ELECTRIC MACHINE, in the widest sense, any machine for producing electric currents by the movement of magnets in the neighbourhood of coils of conducting wire, or by the movement of the coils near the magnets. All such machines are based on the important discovery made by Faraday in 1831 that instantaneous currents are induced in conductors by the movement of magnets in the neighbourhood. The first machine of this kind, known as a *magneto-electric machine*, was devised by Pixii in 1833, and was soon afterwards improved by Saxton. Clarke improved the machine still more in various ways, chiefly by causing the coil instead of the permanent magnet to rotate. In 1854 Siemens introduced a new form of armature, as the revolving coil with its iron core is called, which marked a great advance. The iron portion is a cylinder with a very wide and deep groove cut along two opposite sides and continued round the ends, and the coil is wound in the groove like thread upon a shuttle. This armature is placed between the opposite poles of a row of horseshoe magnets which beset it along the whole of its length, and it is rotated by means of a driving-band

passing round a pulley at one end. As in Clarke's machine, the polarity of this electro-magnet is reversed at each half-revolution, and consequently a commutator is required to make the alternately opposite currents of the coil pursue a uniform direction in the external circuit. Wilde's machine consisted essentially of two Siemens machines, one above the other, the current from the former being made to produce a powerful electro-magnet between whose poles the second armature rotated. The most important development of the principle of these machines, however, was one proposed almost simultaneously by Wheatstone and Siemens in 1867, but it would appear that a machine on this principle had been patented in 1854 by a Swede, Soren Hjorth. They suggested that the induced current, or a part of it, should be made to circulate round the soft-iron magnet which produced it. Iron has usually some traces of permanent magnetism, especially if it has once been strongly magnetized. This magnetism serves to induce very feeble currents in a revolving armature, and these currents may by being sent round the iron magnet be made to increase its magnetization. This in turn strengthens the induced currents, and so by such continued mutual action powerful currents may be soon obtained. Such self-exciting machines were formerly distinguished from those hitherto mentioned as *dynamoes*, but this name is now applied more widely. Gramme's machine employed a form of armature known as the *ring armature*, but it would appear that this had been used in some earlier machines. This armature had the effect of reducing fluctuations in the strength of the current to a negligible quantity. A modification of the Siemens armature in the direction of the ring form produced the drum armature. *Dynamos* may be classified as *direct-current*, in which the external current flows constantly in one direction, or *alternating*, in which there is no commutator, and the current in consequence flows alternately in one direction and the opposite, the reversals succeeding each other hundreds or thousands of times in a second. There are three types of direct-current dynamo—the *series* dynamo, the *shunt* dynamo, and the *compound* dynamo. In the first of these the whole current from the armature passes through the field-magnet coils, which must be composed of stout wire, so as to have low resistance and not consume much of the energy of the current. In the second form the current from the armature divides into two parts, the larger part going through the external circuit and the smaller through the field-magnet coils, which must in this case consist of a great length of fine wire. The compound dynamo combines these two methods of winding, and preserves an almost constant electro-motive force. The electro-magnets of an alternate-current dynamo are supplied with a constant current from a small direct-current dynamo. Among the numerous recent forms of dynamo the Brush, the Wallace-Farmer, the Weston, the Maxim, and the Edison may be mentioned. For a full account of the subject the reader is referred to Silvanus P. Thompson's work on *Dynamo-Electric Machinery* and Urquhart's *Dynamo Construction*. See also *MAGNETO-ELECTRIC MACHINES, ELECTRIC LIGHTING, ELECTRIC RAILWAY, &c.*

DYNAMOMETER, an instrument for measuring the relative strength of men and animals, or the force of machinery. When the pull upon a draught implement, as a plough, is the point to be determined, the dynamometer is made a link in the draught-chain, and then subjected to the tension which it is desired to ascertain. In such cases the instrument used is simply a spring; and by the amount of extension or collapse which it suffers the intensity of the strain which it has experienced is indicated. One of the most common dynamometers of this kind

is formed of an elliptical spring, which, in proportion to the longitudinal extension suffered when in use, experiences a lateral collapse, the measure of which indicates the amount of strain to which it has been subjected. In Clyburn's dynamometer the strain is indicated by the compression of a spiral spring inclosed in a cylindrical case, the extent of the strain being shown by an index moving along a scale on the outside of the implement.

DYRRHACHIUM. See *DURAZZO*.

DYSART, a royal and parl. burgh and seaport of Scotland, in the county of Fife, on the Firth of Forth. There is a considerable business done in the manufacture of linen goods and in yarn spinning. Coal is shipped in some quantity. Dysart House, formerly a seat of the Earls of Rosslyn, is in the immediate vicinity. Dysart possessed great importance in the fifteenth century, and was famous for collieries and salt-works. A little to the west, on a steep crag, stand the ruins of the ancient castle of Ravenscraig. Dysart is one of the Kirkcaldy district of burghs. Pop. of royal burgh in 1891, 3022; of parl. burgh, 12,849; in 1901, 3539 and 15,256.

DYSENTERY (Greek *dys*, difficult, *entera*, bowels), a BLOODY FLUX, a disease consisting in an inflammation of the large intestine, especially its lower end. The mucous lining of the bowel becomes intensely congested, and ulceration may ensue through the stripping off of patches of the membrane. Should recovery take place and this heal, it is at the risk of seriously contracting the tube. Dysentery is commonest in tropical countries, especially in low-lying, swampy regions, and it often does great havoc in armies encamped or operating in such districts. It is not a common disease in Great Britain. Its causes are somewhat obscure, but the alternation of wet and cold with warm, dry weather, has been thought to have something to do with it. Bad air, bad food, and especially bad drinking-water certainly tend to produce or intensify it. Persons nursing patients suffering from dysentery do not run any risk of infection. It is as yet uncertain whether or not water polluted by the dysenteric discharge might cause the disease if drunk. The symptoms of the disease are as follows: the patient feels out of sorts for a time, or perhaps feverish, with hot, dry skin and clammy mouth, and is then suddenly attacked by diarrhoea. He passes a large loose stool, and is afterwards afflicted with painful straining to dislodge something from the bowels (*tenesmus*), but only small quantities of mucus, often mixed with blood, are discharged. Fæcal matter occurs in the stool only occasionally as small hard lumps. Severe pains in the bowels (*tormina*) accompany the tenesmus. After about eight days the stools become very offensive, cease to be mucous, and appear like flesh washings with shreds floating in them. The patient also suffers from flatulence, and has pain in making water, which, moreover, is high-coloured. Extreme prostration with faintness, weak pulse, hiccup, and vomiting, and a feeling of sinking at the heart indicate a fatal termination. Those who recover improve about the sixth or tenth day, but the disease may remain in a chronic form, characterized by constant colicky pains and loose stools, with tenderness of the belly. This chronic form will usually in time lead to a liver disease which will prove fatal. Many substances have been recommended as remedies for dysentery, among them calomel, opium, ipecacuan, tincture of witch-hazel, lead and blamuth preparations, logwood, &c.

DYSPEPSIA, indigestion or difficulty of digestion; disorder of the digestive function. The digestive organs in man include the mouth, armed with teeth for mechanically breaking down the food

by mastication; the salivary glands, furnishing a fluid intimately combined with the food in mastication; the pharynx, a muscular and membranous bag for the reception of the masticated bolus from the mouth; the oesophagus, a muscular and membranous tube for conducting the bolus into the stomach; the stomach, a muscular and membranous bag, or enlargement of the alimentary canal, secreting a fluid, in which the food is subjected to a fermentive process, until reduced to *chyme*; the duodenum, or first part of the bowel, in which the chymous mass is submitted to the action of the biliary and pancreatic fluids, and in which the nutritive elements begin to separate from the innutritive matters, and to be absorbed by the lacteals; the liver and pancreas, furnishing, the one bile, and the other a juice containing a combination of very active ferments, which fluids are mixed with and act on the chyme in the duodenum, the jejunum and ileum, or small intestines, in the course of which the separation begun in the duodenum is completed, and nearly the whole of the nutritive principles are rendered fit for absorption, forming chyle, and are absorbed; and lastly the large intestine, a reservoir for all the excrementitious principles, and which, in it, are converted into feces. The whole of these organs compose the apparatus of digestion, but the stomach and duodenum are the most important. The masticated and insalivated food having passed into the stomach, it is intimately mixed, by means of the churning movements of the stomach walls, with the liquid secreted by the glands of the gastric mucous membrane, at a temperature of 100° Fahr. This liquor, called *gastric juice*, contains an active ferment, called *pepsin*, and is acid from the presence of a small quantity of hydrochloric acid. It acts upon the albuminous constituents of the food, converting them into peptones. Albumins cannot pass through organic membranes, and cannot, therefore, be absorbed into the circulation, while peptones can. Fat is liberated in the stomach by the conversion and consequent solution of the containing cell walls, but neither fats nor starches are directly affected by the gastric juice. In a short time the food becomes pulpy, and then reduced to a semi-fluid of a light grayish colour called *chyme*. The *chyme* having passed into the duodenum, meets with the pancreatic liquor, the bile, and intestinal juice secreted by the glands of the mucous membrane of the bowel. The acids of the chymous mass are neutralized by the alkaline principles of the bile, which also aid the absorption of fat, while the ferments of the pancreatic juice, aided by the intestinal juice, convert albumins into peptones, starch into sugar, and fat into fatty acid and glycerine, rendering them all fit for absorption. The nutritive material is then absorbed by the lacteals of the villous projections of the mucous membrane and by the blood-vessels. In the large intestine the absorption of nutritive material is completed; and the feces thus acquire a consistent character.

From this sketch of the function of digestion it is evident that its most important processes are: those performed in the mouth, consisting of (1) chewing, and (2) the action of saliva on the starchy parts of the food; those of the stomach, (3) the contractile movements mixing the alimentary mass with the fluids as they are secreted, (4) the action of gastric juice on albuminous parts of the food; those in the bowel, of (5) the action of bile on fat, (6) the action of pancreatic juice on starch, albumin, and fat, and (7) the action of intestinal juice.

Derangement in any of these processes may give rise to dyspeptic symptoms, dyspepsia being not so much a disease in itself as a symptom attached to diseases of the apparatus of digestion. Notice can only here be given of some of the more common

types of dyspepsia, noting their more pronounced symptoms and the lines of their treatment.

(1.) Slow digestion is a very common form of indigestion. Its usual symptoms are a sense of weight and fullness after taking food. It is accompanied by costiveness. There are also coated tongue, a bad taste in the mouth, flatulence, and, accompanying occasional discharges of wind from the mouth, there are small quantities of sour material. The failure to digest speedily, and the accompanying constipation, induce a tendency to headache, and a feeling of dulness, mental depression, and disinclination for exertion. Very often such a condition of affairs is induced simply by want of proper regulation of times of eating, and of quantity of food, by want of exercise, and so on. In such cases the liver is sluggish. It may be this was the immediate cause of the indigestion, but in any case it tends to maintain and aggravate it. In other cases the indigestion is what is termed *atonic*, that is, due to want of tone. There is lack of energy in the stomach, deficient secretion of gastric juice, or lack of power in the juice to perform its work. This want of tone in the stomach may be simply part of a general condition of body, that general condition, for instance, termed *anæmia*, in which the sufferer is pale and wants the ruddy look of health. Its treatment proceeds on very simple lines. Let food be taken at regular intervals of five hours or so, let it be light and easily digestible, fatty food, pastries, and highly-spiced dishes being avoided. In fact the simpler the diet the better. Let regular exercise be taken. If the person is in a position to have horse exercise nothing can be better. Next the constipation must be got rid of. For this an excellent remedy is the resin of podophyllin ($\frac{1}{4}$ th grain), the extract of *nux vomica* ($\frac{1}{4}$ th grain), and the extract of gentian (1 grain) made into a pill. One such pill should be taken every morning before breakfast. As a rule it produces no discomfort. Instead of this a pill containing 5 grains of rhubarb and 1 grain ipecacuanha powder may be used. In either case the pill should be continued for ten days or longer. It is useless, however, to take such pills if bad habits of dieting are maintained. In the atonic form of dyspepsia dilute hydrochloric acid is extremely valuable. It should be given in doses of from 5 to 10 drops in a little water, *always immediately after meals*. In many cases not acid but alkaline treatment is best, but the *alkali must be given before meals*. The best alkaline medicine for the purpose is the bicarbonate of soda, in doses of 8 to 15 grains. Bitter tonics are also prescribed, such as tincture of gentian root, chiretta, &c., which may be given with the soda. In cases of general weakness preparations of iron are used with tonics, for example quinine and iron tonic, &c.

(2.) Another common form of indigestion is that arising from catarrhal conditions of the stomach or bowels—inflammatory conditions of the mucous lining of the stomach. The irritation may be temporary, in which case the indigestion is likely to be short-lived, and perhaps severe. But if the irritation be chronic the indigestion is of a most intractable sort, indeed, as long-lived as the irritation. In such a case there is loss of appetite, a bitter taste in the mouth, coated tongue, and especially sickness and vomiting, the vomiting, it is to be observed, coming on very soon after a meal. Headache usually attends it; the pulse is quicker and fuller, and the skin hot. If the vomiting be frequent or severe it is likely soon to be tinged with bile, and so people say it is a bilious attack. This is as likely as not a mistake. It is the frequent efforts of vomiting that force up some of the bile out of the small intestine into the stomach, from

which it is afterwards expelled. It is the vomiting that causes the bile in the stomach, not the bile that causes the vomiting. Of course the irritation may not be so great as to make the symptoms marked, and they are more or less modified, and accompanied frequently by the eructation of badly smelling gases, when the bowel shares in the irritation. Looseness of the bowels with colicky pain is present. Now an irritable condition of the stomach may be caused by swallowing food hastily, without proper chewing. The remedy is evident, and if it is the want of teeth that caused the food to be swallowed in masses, let false teeth be properly fitted. It may be improper food that has created the disturbance. In this connection it is to be noted that some people are affected by certain quite ordinary foods as if they were irritant poisons. Some people cannot take mutton without sickness and vomiting setting in. Even milk has been known to act similarly. With many people a boiled egg produces nausea, depression, and diarrhoea. A common cold, ending in gastric catarrh, will produce this kind of indigestion. But nothing so readily induces the catarrhal condition with its attendant irritability as excess in alcohol. The treatment of this form consists first of all in avoiding all substances that are likely to set up or continue the irritable condition of the digestive organs. Secondly, nothing has such a marked effect on an irritable stomach as careful regulation of the quantity of food taken. If a person is troubled with constant vomiting of food, let the quantity of food be gradually reduced till the amount is found which the stomach retains. If it is a very small amount that is retained, let it be repeated at short intervals, and let the quantity be gradually increased and the intervals lengthened until the natural condition is restored. A short attack of irritability of the stomach and bowels will be wonderfully allayed by sips of iced milk, or by the sucking of small pieces of ice. The powder of *ipecacuanha* is a favourite remedy for such cases in $\frac{1}{2}$ -grain doses. The cases of chronic irritation—chronic catarrhal conditions—are, however, extremely difficult to treat, and a great many remedies have been tried. A valuable remedy is bismuth. Trousseau, the French physician, advises it in large doses along with precipitated chalk, at least 10 grains of each being taken together before each meal. Failing this, acids may be tried,—dilute hydrochloric acid taken in 10-drop doses in water at the end of each meal. Effervescent draughts are also useful, and much benefit has often been derived from such an effervescent draught as Eno's fruit salt affords, taken early every morning.

(3.) Acid indigestion is marked by an excessive secretion of very acid juice. Severe heartburn is common in this form of the complaint, and every now and again a small quantity of the acid material comes up with eructation, seeming to burn all the way up, till all down the gullet feels raw and fiery, and even the teeth are set on edge. This may go on for hours, and be accompanied by a sense of fullness as if the food were unable to escape from the stomach. The acidity is often accompanied by flatulence. Again it must be insisted on that the person regulates his food with care. The bowels should also receive attention, and, if necessary, a saline draught should be taken in early morning. Eno's fruit salt or similar medicine will do, or a wine-glassful of a mineral water like Hunyadi Janos. Now it is certain that often nothing relieves this condition like an antacid, such as soda or magnesia, of which half a tea-spoonful may be taken in water. A tea-spoonful of seidlitz salt dissolved alone in water is useful, and helps also to relieve the bowels. The substrate of bismuth, 10 to 15 grains, a quan-

tity that can easily be picked up at a sixpence, is also advised. Acid indigestion, however, sometimes yields most readily to acid treatment, but the acid (10 drops of dilute hydrochloric acid in water) must be given a short time before each meal. When given at this time it checks the excessive secretion of acid and prevents the development of acid by fermentive changes in the stomach.

(4.) Flatulent indigestion is characterized by the formation of gases in great quantity in the stomach and bowels, and is often accompanied by acidity. In very many cases confirmed flatulent indigestion is due to nothing else than bad regulation of diet, to too long intervals between meals, and to the too frequent use of tea. Let these errors be first of all corrected. Where the flatulence is the main symptom and the gases appear to be developed by fermentation, charcoal is the best remedy. It should be taken either soon before or immediately after food, according as the wind is developed immediately on eating or some time after. The dose is 5 to 10 grains of wood charcoal. In other cases where the flatulence is only one of other general dyspeptic symptoms, an acid with some vegetable tonic is valuable. In women flatulent dyspepsia is often accompanied by palpitations, headaches, attacks of giddiness and faintness, &c. In such conditions the aromatic spirit of ammonia with spirit of chloroform is very beneficial. The popular remedy, peppermint water, gives temporary relief. So also does ginger, 5 to 20 grains in warm water, or tincture of cardamoms, a tea-spoonful in water.

(5.) Indigestion with excessive appetite, takes the form of a persistent feeling of emptiness in the stomach, uneasiness, and craving for food even a short time after food has been taken. This craving for food is termed *bulimia*, and is common in women. The condition seems often due to the food being too rapidly passed on from the stomach into the bowels, so that digestion is not properly accomplished. Looseness of bowels usually is present. The treatment for this kind of indigestion is opium in some form or another, and in very small doses.

(6.) Painful digestion may arise from many causes. Heartburn is one kind of pain, and flatulence usually causes pain also. In these cases treatment for the acidity causing the heartburn, or for the flatulence, ought to remove the pain. Again a sense of uneasiness may grow to actual pain in slow and weak digestion, for which the remedies mentioned under slow digestion ought to be used. The pain may take a spasmodic character, and may extend to the back between the shoulders—the kind of pain popularly called 'cramp in the stomach,' and more learnedly *gastrodynia* (*gaster*, the stomach, and *odune*, pain or anguish). The nitrate of bismuth in 10-grain doses is very useful for this, and if this fails 3 grains of the compound *ipecacuanha* powder should be added to it. Sometimes the hydrochloric-acid treatment (4 to 8 drops immediately after a meal) is efficacious for this affection also. The water-brash (*pyrosis*) is another form of painful digestion. Pain at the pit of the stomach is followed by the putting up of mouthfuls of a watery and sour, or sometimes insipid fluid. The pain is often severe, and the quantity of fluid considerable. Bismuth should be used as prescribed for cramp in the stomach. If necessary, acids may be tried before food if the fluid put up be sour, after food if it taste insipid. Colic, another symptom of intestinal derangement, is due generally to irregular and spasmodic contractions of the large bowel. Severe twisting pains are experienced about the region of the navel, the pulse is usually lowered and the face pale and anxious looking, the absence of fever helping to distinguish colic from an inflam-

matory attack. Pressure on the stomach relieves the pain, which usually yields readily to the application of hot cloths to the belly, accompanied by a dose of castor-oil or other simple medicina. In the case of an adult 15 drops of laudanum may be given with or shortly after the castor-oil. (For information on the regulation of diet see DYTETICS.)

DYTISOUS, more correctly DYTIOUS. See WATER BUFFLE.

DZIGGETAI, or KIANG (*Equus Hemionus*), an animal found in Central Asia, allied both to the horse and the ass. Its distinguishing marks are, no long hairs on the tail except at the extremity, a longitudinal dorsal streak, broadest over the small of the back, and no cross-band on the shoulders. In other respects it resembles the horse in front, and the ass behind. Like the ass it has a large head, but the form of the head is like that of the horse. The ears are not so long as those of the ass, and in shape resemble horses' ears. It is a delicately formed animal, and very light in its movements; it runs with a rapidity exceeding that of the best Arabian horses. It has been acclimatized in Europe, and has brought

forth young in several zoological collections. It has even been broken in and trained to the saddle.

DZOUNGARIA, ILI PROPER, or THIAN-SHAN-PK-LOO, an extensive territory in Central Asia, the boundaries of which are not very well defined. It stretches from about 41° 30' to 48° 41' N. lat., and from about 78° to 96° E. lon. The surface consists chiefly of an elevated and almost desert plateau, surrounded and partly intersected by lofty mountain-chains. Large tracts are altogether or nearly unfit for human habitation, but some of the plains and valleys are covered with good pasture. Dzoungaria was originally the independent empire of the Dzoungars, a branch of the Mongols, but about 1754 the territory was subjugated by the Chinese, under whom it remained till about 1864, when a rebellion broke out, and the Chinese settlements in Dzoungaria were completely destroyed. A period of anarchy followed, which was not put an end to till in July, 1871, Kuldja was occupied without opposition by the Russians. Since then the greater portion of Dzoungaria has remained in the hands of the Russians, the rest being again under Chinese rule.

E.

E, the second vowel and fifth letter of the Latin alphabet, and of other alphabets, such as the English, German, French, Italian, Spanish, &c., derived from it. In Latin it had sometimes a long and sometimes a short sound, but in Greek two characters were employed to represent these different sounds, namely, Ε or ε for short e, and Η or η for long e. E was the weakest of the Latin vowels, and accordingly it frequently took the place of the other vowels when their sounds became weakened. Many Latin words which in their simple form contain æ change this to e when they are compounded, as from *fallo, refello*; from *mando, commendo*; from *castus, incestus*; from *aptus, ineptus*; and this is particularly the case before two consonants. E was always used also in the reduplication of verbs having a in their first syllable, as *cado, cecidi*; *pario, peperii*; *tango, tetigi*, &c. E was sometimes substituted for o and u, but this was not very common; examples are *vertex, vester, vorto*, for *vortex, voster, vortio*; *déjero* and *pejero*, from *jurō*. E appears instead of i in the neuter of adjectives in *is*, as *facile, gracile, arce*, &c., and sometimes in datives of the third declension, as *morte* for *mortis*. It is also frequently found in manuscripts instead of the diphthongs æ and œ. In the Romance languages we find e sometimes taking the place of i in Latin, and i sometimes taking the place of the Latin e; as Lat. *mittere*, It. *mettere*, Fr. *mettre*; *mesasticum*, It. *mesaggio*, Fr. *message*; *limbus*, It. *lombo*; *lignum*, It. *legno*, &c.; *cera*, Fr. *cire*; *medius locus*, Fr. *miliieu*; *meliorare*, It. *migliorare*. We also find the Latin e represented by ie in French and Italian, as *mel*, It. *miele*, Fr. *miel*; *pes*, It. *piède*, Fr. *piéd*; *brevis*, It. *brieve*, Fr. *brief*, &c. The letter E in English has at least five sounds, as in the following five words: *mete*, *met*, *there*, *obey*, *her*. It is frequently used at the end of a monosyllable word to indicate the preceding vowel is to be pronounced long; compare *pen*, *mad*, *met*, *can*, *not*, *tub*, with *pine*, *made*, *mate*, *cane*, *note*, and *tube*. The number of e sounds in French is variously given by different authorities, some admitting only three, others as many as nine. The French Academy recognises only three sounds

of e in French, the *e ouvert* or open, the *e fermé* or shut, and the *e muet*, all of which occur in the words *sévère, évêque, échelle*. To these however there ought at least to be added the e of such words as *je, te, me*, &c. In German there are four different ways of pronouncing the letter e; 1, merely as an aspiration, or very short indeed, as in *haite* or *hoffen*; 2, short, like the English e in *bet, met*, as in *recht, rennen*; 3, long, like the English a in *fate*, as in *reden, predigen*; 4, like the French *e ouvert*, or like the German a, as in *Flend*, although little distinction is generally made between the two latter. Some provinces generally pronounce both like the latter; others pronounce them like the former, or like a in *fate*. The letter e may be called an intruder into the German language, because it has taken the place formerly occupied by full and melodious vowels, and it occurs too often. E is the commonest letter in English. E, in the Greek numeration, signified five. E, as an abbreviation, stands, in English, for *east*. On ancient medals it stands for the names of cities which begin with this letter; for *exercitus, effigies, edictum*. E, in music, is the third note of the diatonic scale of C, answering to the *mi* of the Italians and French. See ABBREVIATIONS.

EADMER, an English monk, the friend and biographer of St. Anselm. He became the friend of Anselm about 1093, and after that date little is known about him till 1120, when he was chosen Bishop of St. Andrews. This dignity, however, Eadmer did not accept, because the Scottish king refused to allow him to be consecrated by the Archbishop of Canterbury, the supremacy of which in Scotland he did not acknowledge. Eadmer accordingly returned to England, and died a simple monk of Canterbury. The time at which his death took place is not known with certainty, but it is supposed to have been in January, 1124. Besides the life of St. Anselm, Eadmer has also written the lives of St. Wilfrid, St. Dunstan, St. Odo, and other English saints, as well as a treatise on the Excellence of the Holy Virgin, and another on the Four Virtues possessed by Mary.

His most important work is the History of his own Time (*Historia Novorum*), a narrative of events in England and the English Church, from 1066 to 1122. The best edition of this work is that of Selden (London, 1628).

EAGLE, a gold coin in the United States of the value of ten dollars, or £2, 1s. 8d. sterling. It was first coined in 1795, in accordance with an act of Congress, dated January 2, 1792. There are also half eagles (first coined in 1795), quarter eagles (first coined in 1796), and double eagles (first coined in 1849), of proportionate values.

EAGLE. The eagles form a group or sub-family (*Aquilinae*) of the great family *Falconidae* which includes the eagles, falcons, and hawks, and forms one of the three great divisions of the order *Raptores* or *Accipitres*. The eagle has been elevated, by the popular voice, to the rank of the noblest and most courageous of the rapacious birds. Its natural fierceness is so great that it has seldom been employed for the purposes of the chase; but the Kirghis and other tribes of Central Asia use the golden eagle to kill antelopes, foxes, and even wolves. The eagle soars to a greater height than any other European bird, from which circumstance the ancients considered it as a messenger of Jove, '*Fulvum aquilam Jovis nuntiam*.' Its sense of sight is exquisite. It lives for a great length of time, even in the captive state. Mr. Pennant mentions one in the possession of a gentleman, which he had kept for nine years, and the person from whom he had received it thirty-two. The leading genera of this sub-family and their most familiar species are as follows —

1. *Aquila*. Bill long, powerful: curve commences at cere, margins sinuous: wings reaching to tip of tail, which is broad and moderately long: tarsi feathered to the toes.

A. imperialis, Bechst. This, the Imperial Eagle, is the largest known species. It lives on the forest-covered mountains of Germany, Hungary, and Dalmatia, and is probably the species to which the popular belief in the courage, strength, and nobleness of eagles is to be traced. It has a large white spot on the scapulars; the tail is black, marked above with gray: the female is fawn-coloured, with brown spots. It has been noticed in Asia as *A. bifasciata*, and as *A. heliaca*. *A. chrysaetus*, the Golden Eagle (see plate at art. ORNITHOLOGY), though smaller than the preceding, measures over six feet from tip to tip of the expanded wings, and 3 feet from the beak to the end of the tail. The adult plumage is perfected in the third year, prior to which the young birds have been spoken of as a separate species, the ring-tailed eagle, *A. fulva*. The adults have the body brownish, becoming darker with age: the feathers of the head and neck pointed, and of a golden-red hue: tail deep gray, barred with brown, and ending with that colour: beak bluish-black: cere and feet yellow: iris brown: wings do not reach to end of tail: female larger than male. The young birds have the inside of the thighs and tarsi white, not brown: lower tail-coverts whitish: greater part of tail white above, but ending in a brown patch. This species is found all over the northern hemisphere, but is less frequent in America, and does not range south of the Himalayas, where, however, it is sometimes confused with the lammergeyer. The nests are of great size, and, situated in inaccessible places, are used year after year; their great size is necessary not merely to support the birds, which weigh about 18 lbs., but also the large quantity of prey which they collect. The eggs are two in number, white, with brownish and purplish blotches. Other species are the Spotted Eagle (*A. scoria*, Gmel.), which is common in India, and even visits Europe; it feeds on small animals: the Tawny

Eagle (*A. fulvescens*, Gray) of Central India: *A. nerioides*, a robust African eagle: *A. morphnoides*, Gould, from Australia: the Black Eagle (*A. Malensis*) of southern India and the Malay Peninsula.

2. The Hawk Eagles include the genera *Spizastur*, Vieill.; *Limnastur*, Vig.; *Morphnus*, Cuv. *Spizastur* has the bill strongly curved; the wings reach to the middle of the tail, which is long and broad: the 4th, 5th, and 6th wing feathers are nearly equal, the 5th the longest. This genus is represented in Africa by *Sp. ornatus*, Vieill.; in South America by *Sp. tyrannus*, Gray, from Brazil. *Morphnus*, also a South American genus, is perhaps closer to the buzzards. *Limnastur* has a short high bill, with a strong falcate on the upper mandible: the wing is short, the tail long and square: the head is usually crested. These birds have a more hawk-like aspect than the preceding. The Variable Hawk Eagle (*L. niveus*, Temm.) is found in Bengal; the Spotted Hawk Eagle in the Himalayas, Khasia Hills, and Ceylon. Several other species occur, whose distinctness is not, however, certain.

3. The Serpent Eagles, *Circæetus*, are found in all parts of the world. *C. gallicus*, the common Serpent Eagle, or Short-toed Eagle (see plate at art. ORNITHOLOGY), ranges through Southern Europe, Asia, and especially North Africa. The bill is shorter and more evenly rounded from the base, and entire on the margin. The wings, which reach nearly to the tip of the broad, even-ended tail, have the third and fourth feathers the longest. The tarsi are naked, and the toes rather short, the lateral ones equal. The adults are darker brown above and on the head than are the young; the under parts are fulvous in youth, with longitudinal brown streaks from chin to breast, the rest white, with a pale brown streak on the centre of each feather. In maturity they are white from chin to vent, and the brown marks are broad stripes which form a zone on the breast. The female is larger than the male, and measures 30 inches. The food is chiefly reptilian, but it will even condescend to centipedes and large insects. In structure and habits this bird is nearer to the buzzards than any other of the eagles. The Crested Serpent Eagle (*Sphorornis*) is confined to south and east Asia.

4. The Fishing Eagles, or Sea Eagles, differ as a group from the other eagles in the less breadth of the sternum posteriorly, and in the presence of a small notch; the intestines are also longer. The Osprey, or Bald Buzzard (*Pandion haliaetus*, Linn.), is represented by specimens from all parts of the world. Mr. Gurney considers that only one species exists in Europe, America, Africa, Asia, and Australia. The female is about 26 inches in length, the male somewhat shorter. It is white on the head, the nape, and under surface, dark-brown on the upper surface; stripes of the latter colour mark the forehead and the tail, and pass from the eyes over the ears; while the breast is marked with brown spots in youth which coalesce into bars in the adult. The claws are rounded beneath, and the sides are prickly with rigid scales. It is a keen fisher, darting down on its prey with violence, and bearing it to the land to be devoured when permitted by the Bald Eagle. The latter (*Haliaetus leucocephalus*), found in North America and north-east Asia, is the symbol of the United States, though Franklin deprecates the selection on account of his mean and dishonest habits. Like all members of the genus his diet is less restricted than that of the true eagles; he even takes carrion, and is especially fond of preying on the industrious fisher, the osprey. The gradations of plumage up to that of maturity have been carefully studied, and are instructive as showing the danger of specific identifications on single specimens. Genera and sub-genera have been founded on specimens from various parts of the world. The

Cinereous or White-tailed Sea Eagle (*H. albicilla*) (see plate at art. ORNITHOLOGY) is found generally throughout Europe. Besides fish it feeds on hares, &c.

The Hawk Eagles are true eagles in respect of their large size, powerful limbs and changes of plumage, the peculiarities, among which the shortness of their wings is most prominent, for which they have been referred to the true hawks (*Accipitrinae*) being insufficient. Unlike the two preceding groups the tarsus is feathered. The genera are chiefly Asiatic, and perhaps the whole group should be restored to the true eagles.

EAGLE, as an ensign. As king of birds the eagle was the bird of Jove, the carrier of the lightning, and thereby expressive of sole or supreme dominion. In this sense he is used as the emblem and symbol of nations, princes, and armies. He was the hieroglyphic sign of the cities Heliopolis, Emesa, Antioch, and Tyre. Among the attributes of royalty which the Tuscans once sent to the Romans as a token of amity was a sceptre with an eagle of ivory; and from that time the eagle remained one of the principal emblems of the republic, and was retained also by the emperors. As the standard of an army the eagle was first used by the Persians. Among the Romans they were at first of wood, then of silver, with thunderbolts of gold, and, under Cæsar and his successors, entirely of gold, without thunderbolts. For a long time they were carried, as the standards of the legions, on a long staff. The imperial eagle of Germany was originally one-headed, and it is said to have been first adopted by Charlemagne, after the pattern of the Roman eagle, on the occasion of his coronation at Rome, as the symbol of the empire founded by him. As a symbol of the German Empire it had a place on the imperial standard so early as the time of Otho II. The eagle was also adopted by the Kings of Prussia, Poland, Sicily, Spain, Sardinia, by the Emperors of Russia, and by the United States of America. Napoleon chose the eagle as the standard of the French army, but it differed from the Roman eagle of the time of the empire in having its wings folded instead of outspread, and in being only gilt, not made of real gold. The eagle of the United States of America stands with outspread wings, guarding the shield below him, on which are the stripes and stars representing the states of the Union, and the motto *E pluribus unum*. The double-headed eagle was first found among the Roman emperors of the East, who thereby expressed their claims to the Eastern and Western Empires. It is first found as a symbol of the German Empire (probably to betoken the union of the imperial and the royal dignity) on a coin struck by the Emperor Louis V. in 1325. In 1846 the double-headed eagle was chosen to be the symbol of the German Confederation, and it is now that of the German Empire. The eagle is also the badge of several orders, as of that of the Black Eagle founded by Frederick I. of Prussia in 1701; that of the Red Eagle, another Prussian order; and that of the White Eagle instituted in Poland in 1825, and now included among the Russian orders.

EAGLEHAWK, a municipal borough in the colony of Victoria, in Bendigo county, 4 miles from Bendigo, with which it is connected by a steam tramway, and 105 miles from Melbourne. It is a clean, well-built place, in a rich gold-mining district. Pop. 7897.

EAGLE OWL. The sub-family to which the Eagle Owl (*Bubo*) belongs has the head large and broad, with conspicuous erectile ear-tufts or horns, and the facial disk less complete than in other groups. The Eagle Owl of Europe (*B. maximus*, Sibb.) attains when mature a length of about 2 feet. The throat is

white, the rest of the body yellowish brown, mottled above with black, below traversed by bold longitudinal black stripes: feet covered to the claws with brownish yellow feathers. This handsome bird is found throughout Europe in mountainous situations, and is even believed to range as far east as the borders of China. It is a solitary bird, and feeds on lizards, frogs, rats, and mice, small birds, and even the young of deer. Two whole rats were taken from the stomach of one shot in the north of Scotland. It nestles in rocks and ruins, and lays two or three round white eggs. A rare bird near Rome at present, its visits were in ancient times of very evil augury, and many quaint superstitions have gathered round it, chiefly perhaps on account of the ear-tufts, which give it an unbird-like aspect (see plate at art. ORNITHOLOGY). Its American representative is the Virginian Horned Owl (*B. Virginianus*, Bp.).

EAGLE WOOD. See ALOES WOOD.

EAGRE, a Norse word signifying the same as *bore* in a river. See BORE.

EAHEINOMAUWE, the native name of the northernmost of the two islands constituting New Zealand.

EAR (*auris*). The ear is the organ of hearing. It is situated at the side of the head, and is divided into external and internal ear. The external ear, which is the least complicated portion of the organ, is composed of the pavilion, or projecting part, called also the auricle or pinna, and the auditory canal. It is of a greater or lesser size, according to the individual. The pavilion is formed of a fibrous cartilage, elastic and pliant: the skin which covers it is thin and dry. There are also seen, upon the different projections of the cartilaginous ear, certain muscular fibres, to which the name of *musculi* has been given. The pavilion, receiving many vessels and nerves, is very sensible, and easily becomes red. It is fixed to the head by the cellular tissue, and by muscles, which are called, according to their position, *anterior*, *superior*, and *posterior*. These muscles are much developed in many animals: in man they may be considered as simple vestiges. The *meatus auditorius*, or auditory canal, extends from the concha or central hollow of the pavilion, to the membrane of the tympanum; its length, variable according to age, is from 10 to 12 lines in the adult; it is narrower in the middle than at the ends; it presents a slight curve above and in front. Its external orifice is commonly covered with hairs, like the entrance to the other cavities. The membrane of the tympanum (*membrana tympani*), of which the name indicates the function, is a membranous partition stretched obliquely across the bottom of the auditory canal, which it separates from the middle ear or drum (*tympanum*). The membrane is semi-transparent, and very thin, although it is composed of three layers; it vibrates under the impression of the sonorous waves, and transmits the vibratory movement to the little bones of the ear. Between the membrane of the tympanum and the internal ear, is the drum or tympanum, a cavity hollowed out like all those of the middle and internal ear, in the petrous portion of the bone. Among the details of its form and organization we remark the *fenestra ovalis*, which communicates with the vestibule, and the *fenestra rotunda*, which leads to the cochlea. The drum also communicates with the mastoid cells, numerous cells which are found in the mastoid process of the temporal bone, containing air, and destined to multiply the vibratory surfaces; and lastly, it unites by a sort of funnel with the Eustachian tube, a canal about 1½ inch in length, which opens into the upper portion of the pharynx, and admits the air into the middle ear. The cavity of the tympanum, and all the canals

which end there, are covered with a very slender mucous membrane: this cavity contains three small bones, which have been named the hammer (*malleus*), the anvil (*incus*), and the stirrup (*stapes*), and which form a chain from the *membrana tympani* to the *fenestra ovalis*, where the base of the *stapes* is fixed. There are some little muscles for the purpose of moving this osseous chain, or stretching and slackening the membranes to which it is attached. The internal ear or labyrinth consists of a bony part, the osseous labyrinth, of which three semicircular canals, the cochlea, and the vestibule are parts, and a membranous part, the membranous labyrinth. The *cochlea* is a bony cavity in form of a spiral. The semicircular canals are three cylindrical cavities, bent in a semicircular form; two of them are disposed vertically, and the other horizontally. These canals terminate by their extremities in the vesti-

ing body first strike the tympanum, and thence are communicated till they ultimately reach Corti's organ, from which they pass along the nerves to the brain.

EARACHE. See **OTALGIA**.

EARL, a degree of the British nobility between marquis and viscount. (For the origin of the title and the dignity, see **ALDERMAN**.) The title was made hereditary by William the Conqueror, and corresponds to the *count* of the European continent. (See **COUNT**.) In official instruments earls are called, by the sovereign, *trusty and well-beloved cousins*—an appellation as ancient as the reign of Henry IV. An earl's coronet is composed of eight pearls, raised upon points, with small leaves between, above the rim. (See plate at **HERALDRY**.) Though not of the highest rank, earl is the title of highest antiquity in England. As the earls for some time after the Norman conquest were called *counts* their wives are still called *countesses*.

EARLESTOWN, a town of Lancashire, between Liverpool and Manchester, 5 miles north of Warrington. There are here the wagon works of the London and N. W. Railway, employing about 1200 hands, and in the immediate neighbourhood are the

Sankey sugar works and other large works. The parish church and schools are handsome structures, and there are several other places of worship. Pop. in 1891, 6688.

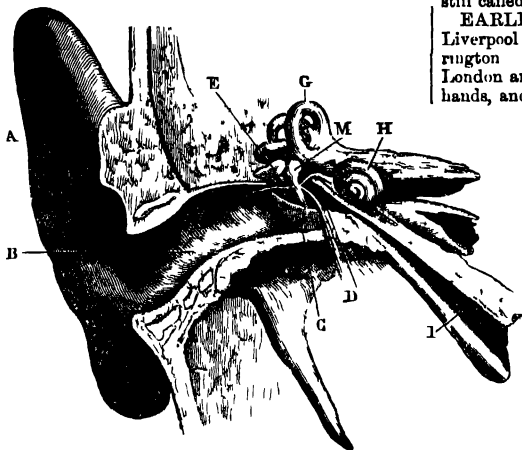
EARL MARSHAL, a great state officer of England, who had, anciently, several courts under his jurisdiction, as the court of chivalry and the court of honour. Under him is the herald's office or college of arms. He had some pre-eminence in the court of Marshalsea (now abolished).

EARLOM, **RICHARD**, mezzotint engraver, was born in London in 1743, and studied under Cipriani. About 1765 he was employed by Alderman Boydell to make drawings from the celebrated collection of pictures at Houghton, most of which he afterwards admirably engraved in mezzotint. In this branch of art he had been his own instructor, and he intro-

duced into the practice of it improvements and instruments not previously used. The fruit and flower pieces executed by Earlom, after Van Huysum, established his fame. In history he distinguished himself by his engraving of Agrippina, from the grand picture by West. He also engraved some oriental scenes after Zoffani, and published two volumes of plates from the *Liber Veritatis* of Claude. He died in London on Oct. 9, 1822.

EARLSTON (originally *Eroldown*), a village of Scotland in Berwickshire, 28 miles south east of Edinburgh. In the vicinity are the ruins of an ancient tower, which belonged to the famous Thomas the Rhymer. The village carries on the manufacture of a description of cotton goods called Earlston gingham; and has besides a tweed factory and dyeworks. Pop. in 1891, 1060.

EARLY ENGLISH ARCHITECTURE, the name generally given to the first pointed Gothic used in England. This style of architecture began to be used in England about the end of the twelfth century, and lasted for about a hundred years. It immediately succeeded the Norman, and finally merged in the Decorated style. It is characterized by long lance-shaped windows, which are often gathered into clusters and inclosed by a large arch, the space between which and the tops of the windows is often pierced with circular, trefoil or quatrefoil



A, Pavillon, or projecting ear B, External auditory canal. C, Membrana tympani D Tympanum E, Incus, or anvil M, Malleus, or hammer. G, Semicircular canals H, Cochlea, or shell. I, Eustachian tube

bule. The vestibule is the central cavity, the point of union of all the others. It communicates with the tympanum, the cochlea, and the semicircular canals. Each of these bony parts is lined by a delicate membrane internally, and contains a membranous counterpart. Thus the bony semicircular canals contain membranous semicircular canals, separated from the bony walls by a thin fluid, the perilymph. The inner wall of the membranous canals is lined by epithelium, some of whose cells possess hair-like processes, and are in connection with filaments of the auditory nerve, or nerve of hearing. The vestibule contains two membranous sacs, communicating with one another, the *utricle*, communicating with the membranous semicircular canals, and the *saccul*, connected with the canal of the cochlea. Perilymph also surrounds these sacs, and their internal lining membrane is also supplied with hair-cells. The bony cochlea similarly possesses a membranous part, being divided, in its length, by partitions partly bony and partly membranous, into three compartments, the middle one being called the canal of the cochlea, or cochlear duct. On the membranous floor of this duct are supporting structures bearing hair-cells in connection with the auditory nerve. These supporting rods and their cells form Corti's organ, the essential part of the organ of hearing. Vibrations of the air produced by a sound-

ornaments. The mouldings consist of alternate rounds and deeply-cut hollows, separated by small fillets. The doorways are often divided into two by a single shaft. The pillars usually consist of thin shafts arranged round a central pier, and the capitals are either of plain mouldings, or are enriched with deeply-out foliage. The ceilings are frequently groined. See Plate IV. at ARCHITECTURE.

EARNEST (in Scotland also called *arrhes* or *arries*), any sum paid in advance, to bind parties to the performance of a verbal agreement. The party is then obliged to abide by his bargain, and is not discharged upon forfeiting his earnest, but may be sued for the whole money stipulated, and damages. No contract for the sale of goods not to be delivered immediately, to the value of £10 or more, is valid, unless a written contract is made by the parties, or those lawfully authorized by them, or earnest is given. In Scotland the earnest is not looked upon as part of the price, unless it bears some considerable proportion to the whole sum to be paid. In England the general view is, that the sum paid as earnest, however small, is part of the price.

EAR-RING, an ornament for the ear, consisting of a ring or hook passing through the lobe, with a pendant of diamonds, pearls, or other jewels, frequently attached. It seems to be in repute among all nations, the most savage as well as the most civilized, and it dates from the most remote antiquity. In Gen. xxiv. 22 we read that Abraham's servant presented Rebekah with an ear-ring, and the same ornament is mentioned in several other passages of Scripture. In the statue of Aphrodite by Praxiteles the goddess was represented with rings in her ears. Among the fine specimens of antique art now extant there are several heads bearing only a single ear-ring on the left ear; and it appears that the Greek children only wore them on the right ear. Ear-rings were not so commonly worn by men as by women, yet, that men did sometimes do so is evident from the fact that the Emperor Alexander Severus thought it necessary to interdict this ornament to men. The ear-rings worn by the ancients sometimes consisted of simple rings, but pendants were frequently attached to them, and these sometimes very heavy. The form of the pendants was very various. The Roman ladies used earrings of great value.

EARTH, the name of the planet which we inhabit. First, as to the form of the earth: To an observer whose view is not obstructed, it presents itself as a circular plain, on the circumference of which the heavens appear to rest. Accordingly, in remote antiquity, the earth was regarded as a flat, circular body, floating on the water. But the great distances which men were able to travel soon refuted this limited idea as an optical illusion; and even in antiquity the spherical form of the earth began to be suspected. On this supposition alone can all the phenomena relating to it be explained. A sphere of so great a magnitude as our earth, surrounded by a stratum of air, or the visible firmament, must present to the eye of an observer, on a plain, the appearance just described. But how could the earth appear, from every possible position, as a surface bounded by the firmament, if it were not a sphere encircled by it? How else could the horizon grow wider and wider, the higher the position we choose? How else can the fact be explained, that we see the tops of towers and of mountains, at a distance, before the bases become visible? But besides these proofs of the sphericity of the earth, there are many others, such as its circular shadow on the moon during an eclipse, the gradual appearance and disappearance of the sun, inequality of day and night, the changes in the position and course of the stars, and the gradual disap-

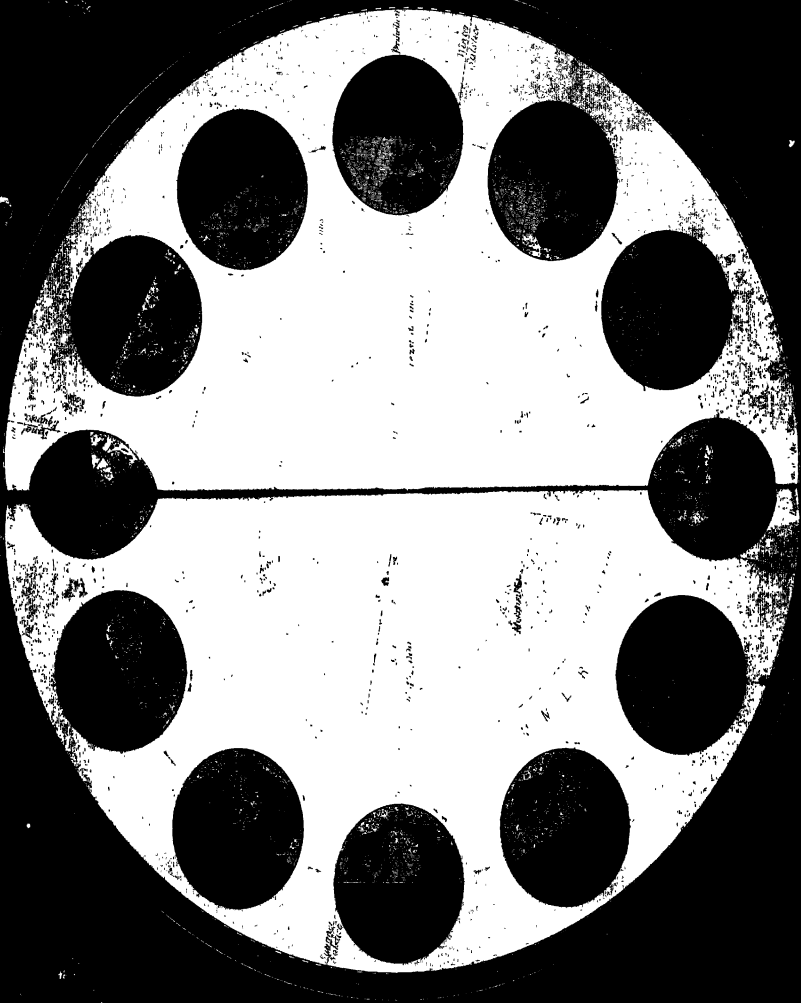
pearance of some and appearance of others, as we go from the equator to the poles. Finally, if the earth were not spherical, it would be impossible to sail round it, which is frequently done. The cause of the earth's sphericity is very evident, if we consider it as having been at first a yielding mass, capable of assuming any form: then, by the force of gravity, every particle contained in it tending towards the common centre, the globular form is the necessary consequence. As to the objection to the sphericity of the earth, drawn by weak and ignorant people, from the imagination that persons and things on the opposite side of the earth from us would fall from its surface, and many similar ones, they will appear to have no force whatever, when we consider that, in a globe of the magnitude of the earth, everything on the surface tends to the centre, and that, in the true meaning of the terms *above* and *below*, all the surface of the earth is below, and all the atmosphere is above.

The earth is not, however, an exact sphere, but is flattened at the poles. This is the form assumed by a globe of fluid or pasty matter solidifying while in rapid rotation round an axis through the centre. The problem of determining the form under these circumstances was first taken up by Newton; but the complete solution of it we owe to Maclaurin, Clairaut, and Ivory. Measurements confirm their results. See also MAUPERTUIS, CONDAMINE, and DEGREE (MEASUREMENT OF).

Another important desideratum for a more intimate acquaintance with the earth was, to fix its magnitude. The labours of the ancients, in this respect, were all fruitless, owing to their want of suitable instruments. Accurate results were first obtained in the year 1615. Willibrord Snellius, a Dutchman, first struck into the only true way, and measured an arc of a meridian from Alkmaar to Leyden and Bergen-op-Zoom, by means of triangles. After him the measurements of Picard, and the later ones of Maupertuis, approximated nearer the truth. These made the circumference of a great circle of the earth 25,000 miles. But it is to be remarked that, in this calculation, the earth is regarded as a perfect sphere. Further measurements of all parts of the surface of the earth have at length fixed rigidly and accurately the true magnitude of it.

If we take a view of our earth in its relation to the solar system, astronomy teaches us that, contrary to appearances, which make the sun revolve about the earth, the earth and the other planets revolve about the sun, and, being themselves opaque bodies, receive from the sun light and heat. The earth completes its revolution round the sun in about 365 days and six hours, which forms our common year. The orbit of the earth is an ellipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year; its least distance has been estimated at 93,648,000 miles, and its greatest at 96,402,000. The mean distance would therefore be 95,000,000 miles. Recent investigations of astronomers, however, have shown that this distance is too large by about 3,000,000; and that the true mean distance is about 91,678,000 miles. In winter we are nearest the sun, and in summer farthest from it; for the difference in the seasons is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. The length of the path travelled over by the earth is estimated at 567,019,740 miles, and as this immense distance is passed over in a year, the earth must move 17 miles a second—a rapidity so far exceeding our conceptions, that it gave very just occasion to the pleasant remark of Lichtenberg, that while one man salutes another in the street, he goes many miles bareheaded without catching cold. Be-

THE EARTH - ITS ANNUAL REVOLUTION AND THE SEASONS OF THE YEAR



NEBULAE } The Crab Nebula 2. Ringed Nebula 3. Comet Nebula in Argos 4. 5. 6. 7. Nebulae are shown by Lord Rosse's Telescope
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sides this annual motion about the sun, the earth has also a daily motion about its own axis (according to mean time, in twenty-three hours, fifty-six minutes, and four seconds). This diurnal revolution is the occasion of the alternation of day and night. But as the axis on which the earth performs its diurnal rotation forms with its path about the sun an angle of $23\frac{1}{2}^{\circ}$, the sun ascends, from March 21 to June 21, about $23\frac{1}{2}^{\circ}$ above the equator towards the north pole, and descends again towards the equator from June 21 to September 23; it then sinks till December 21, about $23\frac{1}{2}^{\circ}$ below the equator, towards the south pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them, which, for all countries lying beyond the equator, are equal only twice in the year, when the elliptic coincides with the equator. Such is the Copernican system of the universe. An illustration of the revolution of the earth round the sun, and the phenomena of the seasons, is given in the accompanying plate.

To the physical knowledge of the earth belongs especially the consideration of its surface and its interior. The earth's surface contains over 196,000,000 square miles, of which scarcely a third part is dry land; the remaining two-thirds are water. Of the surface of the earth Europe comprises about one fifty-fourth part; Asia, one fourteenth; Africa, a seventeenth; and America, a sixteenth. The Australasian and Pacific islands together are somewhat larger than Europe. The population of the whole earth is estimated at from 1450 to 1500 millions. The interior of the earth is entirely unknown to us, as the depth to which we have been able to penetrate is nothing in comparison with its diameter. That there must be a high temperature in the interior is, however, certain. On this subject see EARTH in SUPP., and as to its density see DENSITY. See also NEBULAR HYPOTHESIS, GEOLOGY, MOUNTAINS, VOLCANOES, EARTHQUAKES, CURRENTS, &c.

The earth, as already mentioned, has two motions, the daily motion round its axis, and the yearly motion in its orbit or revolution round the sun. The theory of the motion of the earth has become memorable in the history of the human mind, showing, as it does, a marked ability in man to resist the impressions produced by appearances, and to believe the contrary of that which had been believed and taught for many centuries. The theory of Copernicus not only founded the modern system of astronomy, but made men eager to examine other articles of their creed, after they were thus convinced that they had erroneously taught and believed the earth to be stationary for 6000 years. All the opinions of the ancients respecting the motion of the earth were speculative hypotheses, arising from the Pythagorean school, which, as we know, considered fire the centre of the world, round which all was moving. Thus we ought to explain the passage of Aristarchus of Samos, mentioned by Archimedes in his *Arenaria*. Aristarchus, as a Pythagorean, held the idea that the earth revolves round its axis, and at the same time in an oblique circle round the sun; and that the distance of the stars is so great that this circle is but a point in comparison with their orbits, and therefore the motion of the earth produces no apparent motion in them. Every Pythagorean might have entertained this idea, who considered the sun or fire as the centre of the world, and who was at the same time so correct a thinker, and so good an astronomer, as Aristarchus of Samos. But this was not the Copernican system of the world. It was the motions of the planets, their stations and their retrogradations, which astronomers could not explain, and which led them to the complicated motions of the epicycles, in which the

planets moved in cycloids round the earth. Aristarchus lived 280 B.C., Hipparchus, the great astronomer of antiquity, 150 B.C., therefore 130 years later. At this time all the writings of Aristarchus were extant, and had the Copernican system been set forth in them Hipparchus would not have despaired of explaining the motions of the planets. The same is true of Ptolemy, in whose *Almagest*, the most complete work of antiquity on astronomy, this system is not mentioned in the account of Aristarchus. Every Copernican speaks of the motion of the earth, but not every one who speaks of the motion of the earth is a Copernican. Copernicus was led to the discovery of his system by consideration of the complicated motion of the planets, and in the dedication of his immortal work, *De Revolutionibus Orbium*, to Pope Paul III., he says that the truth of his system is proved by the motion of the planets, since their successive stations and retrogradations are the simple and necessary consequence of the motion of the earth round the sun; and we need not take refuge in the complicated epicycles. Copernicus did not live to see the persecutions which the Roman Catholic priests raised against his system. They began only 100 years later (about 1610), when the telescope was invented, when the moons of Jupiter and the phases of Venus were discovered, and by these means the zeal for astronomy had been highly excited. Every city in Italy was then a little Athens, in which the arts and sciences flourished. Galileo obtained high distinction, and defended the new system of the world. The Roman inquisition summoned him before its tribunal, and he was compelled to abjure this theory. (See GALILEO.) The general sympathy for the fate of this astronomer increased the popularity of the system, and it was as violently defended on one side as it was attacked on the other. Among the arguments against the motion of the earth it was alleged that a stone falling from a tower did not fall westward of the tower, notwithstanding this had advanced eastward several hundred feet during the four or five seconds of the fall of the stone. Copernicus had answered justly: the cause of its remaining near the tower is, that it has the same motion eastward, and, in falling, does not lose this motion, but advances with the earth. Galileo said the same, and asserted that a stone falling from the top of the mast of a vessel at full sail, falls at the foot of the mast, notwithstanding the mast advances perhaps 10 or more feet during the fall. Gassendi tried these experiments in the harbour of Marseilles, and the stones fell at the foot of the mast, notwithstanding the vessel was under full sail; Galileo therefore maintained that it is impossible to draw any conclusions concerning the motion of the earth from such experiments, since bodies would fall on the earth in motion precisely the same as on the earth at rest. In 1642 Galileo died. In the same year Newton was born. He proved in 1679 that the opinion of Galileo was erroneous, and that we certainly can try experiments on the motion of the earth; that the balls would not deviate westward, but would fall a little eastward of the plumb-line, about a half inch at the height of 300 feet. The cause is this: since the top of the tower is at a greater distance from the axis of the earth than its base, the motion must be greater at the former point than at the latter; the ball in falling does not lose this motion, and therefore advances before the plumb-line, which strikes the foot of the tower, since it has a less motion eastward. This hint given by Newton was followed by Hooke. He tried experiments on the motion of the earth at a height of 160 feet, and asserted that he succeeded. Only 112 years later, a young geometri-
cian in Bologna, Guglielmini, attempted to repeat

these experiments, which had been considered very difficult by astronomers, in the tower Degli Asinelli, in that city, at a height of 240 feet. After having surmounted all difficulties, he succeeded in causing the fall of sixteen balls which perceptibly deviated eastward. But Guglielmini committed an error in not suspending the lead every day when he tried his experiments, of which he often made three or four in one night. He did not drop the plummet until after he had finished all his experiments, and as it did not come to a perpendicular position until six months, on account of stormy weather, the tower in the meantime was a little bent, the point at which the plummet should have fallen was altered, and his experiments were lost. This happened in 1792. Benzenberg, a German, performed similar experiments in 1804, in Michael's Tower, in Hamburg. He let fall thirty balls from the height of 235 feet; the balls deviated from the perpendicular 4 lines eastward. But they deviated at the same time $1\frac{1}{2}$ line southward, probably owing to a gentle draft of air in the tower. He repeated these experiments in 1805, in a coal-pit, at Schleibusch, in the county of Mark, at the height of 260 feet; there the balls deviated from the perpendicular five lines eastward, just as the theory of the motion of the earth requires for the latitude of 51° , but neither southward nor northward. From these experiments Laplace calculated that the chances are 8000 to 1 that the earth turns round its axis. The invention of the telescope, by means of which the rotation of Jupiter was soon observed, but still more Newton's discovery of universal gravity, and of the nature of the celestial motions, established the theory of the motion of the earth; and in modern times no man of intelligence doubts it any longer. The French general Allix, however, endeavoured to prove that the motion of the planets does not depend on the law of gravitation. The flattening of the earth at the poles, and the diminution of gravity in the vicinity of the equator, proved by experiments on the motion of the pendulum in the equatorial regions (see PENDULUM), also give as convincing proofs of the rotation of the earth, as the aberration of light (see ABBERRATION) affords of the revolution of the earth round the sun. Foucault's pendulum experiment is a beautiful illustration of the earth's rotation. See FOUCAULT'S PENDULUM EXPERIMENT.

EARTH CURRENTS. Telegraph lines, and particularly long submarine lines, are constantly troubled by violent electrical disturbances of the nature of transient currents, which rush in one direction or the other through the line. The name *earth currents* is given to these movements of electricity. They are frequently so powerful and so changeable as to render the use of the telegraphic instruments for the time impossible, the earth currents passing so rapidly as to confuse the speaking signals completely. The nature of these disturbances is not thoroughly understood. They are found, however, to be very intimately connected with the perturbations of terrestrial magnetism called *magnetic storms*, and these, it is well known, are closely connected both with the appearance of the *aurora borealis*, and with the occurrence of the sun's spots. (See STORM—Magnetic.) It seems probable that earth currents and the aurora are due to secondary discharges taking place in consequence of alterations in terrestrial magnetism, and that these alterations in terrestrial magnetism are caused by violent solar disturbances.

EARTHENWARE, as distinguished from porcelain, is opaque, as distinguished from stoneware the body is dull and earthy. It consists of clay, such as that from Cornwall, mixed with *ground flints* for the white and better kinds, or of common clay, sometimes mixed with sand and lime, and frequently coloured red

or brown by iron, for the coarser varieties. The glaze depends on the quality of the ware; generally it is of a readily fusible character and contains lead; but a simple salt glaze is employed for common articles. Occasionally the unglazed body is employed, as for water-bottles, cream-jugs, vases, and ornaments; these have generally a reddish-brown colour, due to iron. The finer kinds of earthenware, such as Majolica, Delft ware, Faience, and Palissy ware, are not only glazed, but are besides elaborately coloured and enamelled and ornamented with raised figures of various kinds. See FAIENCE, POTTERY.

EARTHQUAKE, a shaking of certain parts of the earth's surface, produced by causes not perceptible by our senses. This motion occurs in very different ways, and in various degrees of violence. Sometimes it is perpendicular, throwing portions of the ground into the air, and making others sink. Sometimes it is a horizontal, undulating motion, and sometimes it appears to be of a whirling nature. Sometimes it is quickly over; sometimes continues long, or recurs at intervals of weeks, days, or months. At one time it is confined within a small circle; at another it extends for many miles. At one time it is hardly perceptible; at another it is so violent that it not only demolishes the works of human art, but changes the appearance of the ground itself. Sometimes the surface of the ground remains unbroken; sometimes it bursts open into clefts and chasms; and then occasionally appears the phenomenon of the eruption of gases, and also of flames, with the ejection of water, mud, and stones, as in volcanic eruptions. The eruptions of proper and permanent volcanoes are preceded by, and proportionate to the agitations of the earth in their neighbourhood. These observations furnish grounds for the conclusion that earthquakes cannot proceed from external causes, but arise from certain powers operating within the circumference or crust of the earth. Moreover, all the phenomena of earthquakes bear so much affinity to those of volcanoes, that there can hardly be a doubt that both proceed from the same causes, acting differently, according to the difference of situation, or different nature of the surface on which they operate. A volcanic eruption differs from an earthquake principally in proceeding from a permanent crater, from which similar irruptions are always liable to recur, while the recurrence of earthquakes, though frequent in the same localities, are not confined exactly to the same spot. All the other phenomena of a volcano, such as the subterranean thunder-like noises, the shaking, raising, and bursting asunder of the earth, and the emission of elastic fluids, the fire and flames, the ejection, too, of mineral substances—all occur, now and then, more or less, in earthquakes as well as in volcanic eruptions, even when at a distance from active volcanoes; and the genuine volcanic eruptions are, as has been remarked, accompanied or announced by shakings of the earth. All our observations go to prove that volcanic eruptions, earthquakes, the heaving of the ground from within, and the disruption of it in the same way, are produced by internal heat, the active manifestations of which proceed from a great depth beneath the surface of the earth. The most remarkable earthquakes of modern times are those which destroyed Lima, in 1746, and Lisbon, in 1755; in the latter above 30,000 persons perished. It extended to Africa, America, and Greenland. Of a still more recent date are the earthquakes that visited Calabria in 1857, by which about 10,000 lives were lost; Peru and Ecuador in 1868, when about 25,000 persons perished; and the island of Iachia, when about 5000 were killed. An earthquake shock that caused some damage to property visited eastern England in 1884.

EARTHS. In former chemical classifications and to some extent still, the term *earth* is applied to denote a tasteless, inodorous, dry, unflammable, non-volatile, insoluble substance, which is difficultly fusible, and of a moderate specific gravity. The earths are seldom found in a state of purity in nature; their general mode of occurrence is in intimate union with each other, and with various acids and metallic oxides. Under these circumstances they constitute by far the greatest part of the strata, gravel, and soil which go to make up the mountains, valleys, and plains of our globe. The more important earths are *lime*, *baryta*, *strontia*, *magnesia*, *alumina*, *zirconia*, *glucina*, *yttria*, and *thorina*. The earths are divided into two classes, the alkaline and proper earths. The alkaline earths are baryta, strontia, lime, and magnesia, and they have a certain resemblance to the alkalies. They are soluble in water, baryta and strontia readily, lime sparingly, and magnesia very slightly. Their solutions affect vegetable colours in the same way as the alkalies. They combine with acids, forming neutral salts, some of which are readily soluble in water, while others are quite insoluble. The proper earths are insoluble in water, infusible at the greatest heat of our furnaces, and, by being exposed to heat, in a greater or less degree, they lose their property of easy solubility in acids. Some of them are incapable of combining with carbonic acid, and the remainder form with it insoluble compounds. The earths were regarded as simple bodies until the brilliant researches of Sir H. Davy proved them to be compounds of oxygen with metals somewhat similar to those of the alkalies potassium and sodium. For a more particular account of the properties of the earths and of their metals consult the articles relating to them respectively in this work.

EARTHWORM. the popular name of various species of Annelida, belonging to the class Chaetopoda and the order Oligochaeta, but applied more particularly to the genus *Lumbricus*. Earthworms have a long, ringed body, which in some exotic species (*Microchaeta Rappi* of South Africa; *Megascolides australis* of Australia) attains a length of about six feet. All earthworms have groups of small rod-like locomotive organs called setae, projecting from most of the segments of the body, but the first segment behind the head, and sometimes several of the succeeding ones, has no setae. Each segment has eight or more setae, arranged in groups on the under surface, or more rarely forming a circle round the body. The body cavity is divided by transverse septa into segments corresponding with the externally marked rings. All the species have a swollen glandular girdle called a *clitellum*, used for secreting the cocoon which incloses the eggs. Earthworms have neither eyes nor ears, but they are sensitive to light and, to some extent, to sound. The alimentary system of true earthworms is very complicated. The food is first received into a muscular pharynx, from which it passes into the long gullet, lined by calcareous glands. Behind the gullet is a swollen crop opening into the muscular gizzard, which often contains stones for use in grinding. The food on leaving the gizzard enters the long intestine, which leads to the anus. Parts of the alimentary canal are lined by characteristic yellow cells. The vascular system of earthworms is well developed, and the excretory system consists of bodies known as *nephridia*, analogous to kidneys, of which there are two to most of the segments. All earthworms are hermaphrodite, but the union of two individuals is necessary for reproduction. Asexual reproduction is unknown among true earthworms. The egg-cocoons secreted by the clitellum

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are usually of an ellipsoidal shape. The young do not pass through any larval stage. Earthworms readily reproduce parts of their bodies that may have been lost by accident. Earthworms burrow in the soil and seldom come to the surface during the day. They feed on decaying leaves, twigs, soil, &c., and their faeces form the well-known worm-casts. The masterly researches of Charles Darwin have shown how important a part they play in the economy of nature by continually exposing fresh soil on the surface, and thus assisting powerfully in the formation of vegetable mould. Some earthworms exhibit phosphorescence. The burrowing Oligochaeta, or earthworms proper, have been grouped in seven families, of which the best known is Lumbricidae, with eight setae in four ventral pairs on each segment. The chief genus of this family is *Lumbricus* (*L. agriicola* is the common earthworm; other British species are *L. herculeus*, *L. rubellus*). The eggs of the common earthworm are deposited below the surface of the soil in spring. The young worms are hatched in summer, and are fully developed in the autumn. The young differ from the mature worms chiefly in size, but they have no clitellum. See F. E. Bedford's Monograph of the Oligochaeta (Oxford, 1895), and Darwin's Formation of Vegetable Mould through the Action of Worms (1881).

EAR-TRUMPET, an instrument used by persons partially deaf to strengthen the sensation of sound. The purpose of the external ear, both in men and beasts, is to collect, by its funnel form, the waves of sound, and conduct them to the internal organs, the seat of the sense of hearing. All the artificial instruments, then, ought to resemble in form the natural ear. They are sometimes made like a trumpet of moderate size, the smaller aperture enters the ear, and the wider is directed to the quarter from which the sound proceeds. But these instruments are inconvenient, both on account of their size and the necessity of continually holding to the ear. Ear-cornets (so called from the French, *cornet acoustique*) are applied to the outside of the ear, and kept in their place by a slender steel spring. A small instrument in the form of a scroll, called an *auricle*, is worn inside the ear, the mouth only being visible. It may be doubted, however, whether these instruments are as efficient as the larger tubes. Flexible india-rubber tubes, kept open by a spiral wire spring, are among the most convenient forms of ear-trumpet.

EARWIG (*Forficula*), a genus of orthopterous insects, forming the type of a family, Forficulidae, which is sometimes regarded as constituting a distinct order under the name Dermaptera, or Euplexoptera. The popular name is derived from the supposed habit of the common species of insinuating itself into the ears of persons who incautiously sleep among grass where it is found. This insect has generally a habit of concealing itself in cavities, endeavouring to reach their innermost recesses, and in some rare cases may have sought a hiding-place in the ear, but its passage into the internal ear would be stopped either by the waxy secretion or by the tympanic membrane. Yet this notion of its habits is widely spread, the insect in Germany being called 'ear-worm' (*Ohrwurm*), in France 'perce-ear' (*perce-oreille*). The common earwig (*F. auricularia*) is found throughout Europe, in North Africa, Asia Minor, and North America. It has a length of from two-fifths to two-thirds of an inch, the male being usually larger than the female. The antennae are thread-like, and the number of joints is fifteen. The fore-wings are short, horny, and somewhat rectangular, but the larger hind-wings are thin and mainly membranous, and fold up somewhat like

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a fan under the fore-wings. The last segment of the abdomen carries a pair of curved, horny, pincer-like appendages, which, in the male, are toothed at the base. The eggs are laid in spring, about twenty at a time, and are carefully protected by the female. The young earwigs differ little, except in size, from the mature insects; they are guarded by the mother during the first period of their existence. Earwigs shun light as far as possible and this habit is taken advantage of by gardeners to catch them and destroy them. Inverted flower-pots and other shelters of a similar kind are placed in suitable spots. The earwigs enter into these during daylight and so fall an easy prey to the gardener. In daytime they may be found in various situations, such as beneath the bark of trees, under stones, in the soil, or in any suitable hole. They feed on fruits, seeds, leaves, and flowers, and at times on animal refuse. Other eight species of this genus are found in Europe. In the genus *Chelidura*, represented in Europe by nine species, the wings are altogether wanting. *Labia* is another genus with only one European species (*L. minor*), which is common in Britain about manure heaps and similar habitats. The genus *Labidura*, with twenty-five or more joints in the antennae, is represented in Britain by a single rare species (*L. riparia*).

EASEL, the frame on which an artist supports the canvas or panel on which he is painting, usually made to fold up after use.

EAST, one of the four cardinal points of the compass, being the point of the horizon where the sun is seen to rise when in the equator, or a point on the earth determined by a perpendicular to the meridian drawn towards the quarter of sunrise. For the origin of the word see **EASTER**.

EAST ANGLES. See **ENGLAND**—History.

EASTBOURNE, a municipal borough and popular watering-place of England, in the county of Sussex, on the English Channel, 3 miles north-east of Beachy Head and 56 miles by rail from London. The present town has grown up since about 1870, and includes the formerly separate villages of Eastbourne, Southbourne, Sea Houses, and Meads. The site is a very healthy one, and the death-rate of the town is very low. Many of the streets are adorned with trees, and not a few of the buildings are worthy of notice. Among the churches the most notable are those of St. Mary, mostly early English, restored in 1891; St. Saviour; All Souls; besides numerous chapels belonging to the Roman Catholics and various Non-conformist bodies. Other buildings and institutions worthy of mention are the fine town-hall, built of brick in Renaissance style; Eastbourne College; the building containing the swimming baths; two theatres; the All Saints Convalescent Hospital; the Princess Alice Memorial Hospital; together with several handsome hotels. The Grand and the Marine Parades extend for some two miles along the sea-front, which is lighted by electric light, and, like the other promenades running parallel to them, they are beautifully laid out. The long pier was constructed in 1872, and in 1894 a new landing-stage was completed. There is a fine pavilion and concert hall, and the beautiful Devonshire Park contains another pavilion, used for concerts and other purposes. There are fine golf-links behind the town. Roman remains have been discovered at Eastbourne on several occasions. Eastbourne gives name to a parl. div. of Sussex. Pop. (1891), 34,969; of parl. div., 66,460; in 1901, 48,837 and 79,416.

EASTER, the great Christian festival commemorating the resurrection of Jesus Christ, observed with great solemnity by the Roman Catholic,

Greek Orthodox, Anglican, and other churches, but not to the same extent by Presbyterians and similar bodies. The Easter festival was regarded by the early Christians as a continuation of the Jewish feast of the passover, and the name of the festival in the classical and Romance languages (French, *paques*; Italian, *pasqua*; Latin, *pascha*) is derived from the Hebrew word for passover. The Greek name *pascha* was afterwards regarded as connected with *paschein* (to suffer), and from this etymological error arose some important changes in the Christian conception of the festival. Easter was much more solemnly observed during the earlier history of the Christian Church than it is now, and the celebrations connected with it extended over a longer season. The week preceding the festival proper, Holy Week, was kept as a time of fasting and preparation, and the week following was given up to joyful celebrations. The ecclesiastical year began with this greatest of festivals. Easter Eve was observed with especial strictness, and midnight services ushered in the morning of the resurrection festival, and marked the end of the Lenten fasting. Candles, waxen tapers, and lamps played a prominent part in such services, and in some cases acquired symbolical meanings. Catechumens were baptized in considerable numbers on Easter Eve. The advent of Easter Day marked the beginning of a season of rejoicing, which terminated on Low Sunday, a week after the festival. All occupations were suspended for a time, many prisoners were released, debtors were forgiven, slaves were manumitted, and almsgiving became general. For long there was considerable controversy in the church regarding the proper time of celebrating Easter. The dispute between the Western and Eastern churches on this matter came to a head in the second century. The Eastern churches celebrated the festival on the fourteenth day of the Jewish month Nisan, the day of the passover; but the Western churches, regarding the festival less as a continuation of the passover than as a commemoration of Christ's resurrection, kept it on the first Sunday after the fourteenth day of Nisan. For some time both practices were allowed, but the council of Nice in 325 A.D. definitely enjoined the general adoption of the Western practice. It was ordained that Easter must be celebrated on the Sunday following the 14th day of the paschal moon; that the paschal moon is that moon of which the 14th day falls on, or next follows, the day of the vernal equinox; that the 21st of March is to be considered the vernal equinox. From that time onwards those who adhered to the Eastern method were regarded as heretics, and were known as *quartodecimans*. The controversy between the Celtic and the Roman church in Britain regarding the keeping of Easter, which was decided in favour of the latter at the council of Whitby in 664, had regard to the cycle to be used in computing the time of the celebration. The oldest cycle was that known as the *octaeteris* (from Greek words for 'eight' and 'year'), which consisted of eight years only and was very imperfect, even with several correcting modifications. That usually known as the Metonic cycle, from its supposed inventor, consisted of nineteen years, and depends on the fact that 19 years differ from 235 lunations by less than one-tenth of a day. The Metonic cycle ultimately displaced all others in fixing the celebrations of Easter. In Britain the Celtic church retained an eighty-four years' cycle at a time when the English church in Britain had, in common with Western churches generally, abandoned it in favour of the Metonic. The keeping of Easter is now based on an artificial lunar cycle which was finally perfected by the

establishment of the Gregorian Calendar in 1582. (See CALENDAR.) The name *Easter*, Anglo-Saxon *Eastre*, like the German *Ostern*, is most probably derived from the name of the feast of the Teutonic goddess *Ostara*, which was celebrated by the ancient Saxons early in the spring, and for which, as in many other instances, the first missionaries wisely substituted the Christian feast. The name is probably derived from a root meaning 'to burn', which also appears in the name of the Roman goddess *Aurora*. This is also the derivation of *east*, in German *ost* or *osten*. Easter-fires, Easter-eggs, and many other customs and superstitions, have all their origin from the ancient heathen feast, which, as the celebration of the resurrection of nature, was very appropriately succeeded by the festival which commemorates the resurrection of Christ.

EASTER ISLAND, an island in the South Pacific Ocean, lon. 109° 17' w.; lat. 27° 8' s. It is of a triangular form, one side about 12 miles long, the other two about 9 each. It has mountains of some height. The soil is fertile, but little cultivated. Yams, sweet-potatoes, &c., are grown. There are some remarkable sculptures on this island, consisting of gigantic stone images in great numbers. In 1882 there were only about 150 natives, 800 of them having been some years before conveyed to Tahiti and the Gambier Islands. In 1888 Chili took possession of the island, and has established a penal settlement here. The pop. is said to be about 1200.

EASTERN EMPIRE. See BYZANTINE EMPIRE.

EAST INDIA COMPANY. From the earliest times the commercial enterprise of Europeans has been directed towards an immediate intercourse with the East Indies. The discovery by the Portuguese at the close of the fifteenth century of the long-sought route to India by the Cape of Good Hope gave a new impulse and direction to this enterprise, and in nearly all the leading nations of Europe steps were taken, either by the direct action of government, or by the formation of chartered and privileged companies, to participate in the advantages of the boundless commerce prospectively revealed in the opening up of this new ocean highway. Some account will be found of the principal companies thus inaugurated in our article COLONY. We here confine ourselves to the history of the greatest of them all, our own East India Company.

The English, in their first attempts to reach India, directed their course to the north-west, as the Dutch did to the north-east. In 1553 Edward VI. chartered a company, with a capital of £6000, which embarked on the career of discovery by equipping three vessels, which were despatched under the charge of Sebastian Cabot, for the discovery of a northern passage to India. This expedition, though failing in its original object, gave rise to commercial relations with the northern coast of Russia. After several other attempts to penetrate to India by land, and by the Cape route, a society was formed in London to prosecute a voyage to the East Indies, and from this humble beginning sprang the company which was destined to acquire the greatest power of any commercial association on record. This society, formed in 1599, with a subscribed capital of £30,133, 6s. 8d., contributed by 101 subscribers of £100 to £3000 each, was evidently designed for a permanent enterprise, though proposing, as an immediate trial of its powers, only a single voyage. A charter was granted to the company by Queen Elizabeth on 31st December, 1600, for fifteen years, renewable for a similar period. In this charter the company is styled, 'The Governor and Company of the Merchants of London trading into the East Indies.' The number of persons incorporated in it is 218, more than double of the

original number of subscribers. The trading limits assigned by the charter are 'all the islands, ports, havens, cities, creeks, towns, and places of Asia, Africa, and America, or any of them, beyond the Cape of Bonæ Esperanza to the Straits of Magellan,' with the exception of such places as are already in possession of any Christian prince in league or amity with the British crown who shall refuse his consent to such trade. The first voyages resulted in large profits, as much as 234 per cent. being realized on some. During this period, although the ultimate intention was probably to form a joint-stock company, only the general management of the undertaking was in common, each merchant venturing his own goods at his own risk. In 1604 James I. granted a license to Sir Edward Michelborne, a member of the Company, to trade to Cathaia, China, Japan, Corea, and Cam-baya. Although these countries had not yet been visited by the Company, it considered this a violation of its charter, and being desirous, from the profits of its first voyages, of extending its operations, it sought a renewal of its charter, that it might not be hindered in raising funds by the suspicion that King James might not respect a charter granted by his predecessor. The charter was consequently renewed in 1609, with the additional power granted to the Company of seizing and confiscating ships and goods of contraband traders, either in the British dominions, or in any of the places where they were authorized to trade. The number of members included in this charter was 276. Instead of the fifteen years' duration, the charter was made perpetual, reserving the power to the crown of recalling it at three years' notice. This renewal of the charter was followed by a subscription for a sixth voyage, the largest that had yet been made, amounting to £82,000.

Among the motives which had induced the Company to press for this renewal of their charter was the necessity they had experienced from the jealousy of the Dutch and Portuguese to send out vessels fitted not only for trade, but for defence, and, perhaps, if the whole truth must be told, for attack. Accordingly, Captain Best, who commanded the eighth expedition, attacked four Portuguese war galleons, conveying 200 sail of merchantmen, off Surat, and gained a complete victory, which so impressed the Great Mogul that he immediately made a treaty with Captain Best, giving the English full liberty to trade in his dominions. This treaty was concluded on 6th Feb. 1613. It was followed at once by a resolution of the Company to trade on a joint-stock. £429,000 was raised as capital, and apportioned in fitting out four voyages for 1613, 1614, 1615, 1617. In 1617-18 the Company was so enlarged as to include 984 proprietors, while a new joint-stock of £1,600,000 was subscribed.

A remarkable event in the history of the Company now took place. These large subscriptions excited anew the jealousy of the Dutch. They had already, to some extent, conceded the right of traffic to the Company in the islands where they held the supremacy, but they regarded the great extension of its operations as a wholesale invasion of their privileges, and they determined, at least, to reserve a monopoly in the trade in spices from the Moluccas. Both parties appealed to King James, and at length a compromise was effected, and by a treaty concluded 7th July, 1619, a sort of alliance was entered into between the Dutch and English companies: the trading rights of the English company, without limit of capital, were acknowledged; purchases were to be arranged by common agents; the English were to have half the pepper and a third of the finer spices; new forts acquired in the Moluccas or elsewhere were to be jointly garrisoned; finally a committee of

defence, consisting of four members from each company, was created with large powers, and twenty warships placed at its disposal. The duration of the treaty was to be for twenty years. This treaty, which was probably not entered into very heartily on either side, was ill maintained, and ended in a tragical occurrence. Under the pretence of a conspiracy the Dutch authorities first tortured and then massacred the leading members of the English factory established under the treaty at Amboyna. When the news of this outrage, which occurred on 27th February, 1623, reached England, it excited the utmost indignation; but the feeble reign of James was drawing to a close, and was succeeded by the disastrous one of Charles I., and it remained unredressed, save that the commission appointed, in the time of Cromwell, to adjust the claims of the two companies, awarded £3615 to the heirs of the sufferers at Amboyna. The English Company, ill supported by the crown, was, during this period, often reduced to great straits. Their stations had often to be abandoned on account of the difficulties entailed by the oppressive character of Dutch rule, their trade became unprofitable, and their stock fell to a discount. To add to these difficulties, Charles I., in 1635, gave a license to a rival company of traders, which became known as Courten's Association. He charged the Company with attending only to their own profit, and neglecting to form permanent stations after the example of the Portuguese and Dutch. An attempt to form a new joint-stock failed, and a partial union with the new association was effected. Differences still remained, the new company advocating the old principle of private ventures, which came at length under the arbitration of Cromwell, who gave his decision in favour of a united joint-stock, and promised a new charter. The Company now proceeded to recognize their foreign establishments. A territorial footing had been acquired in Madras in 1640, to which settlement was given the control of all the factories in Bengal and the Coromandel coast, the supreme council in India still remaining at Surat. A new charter, granted by Charles II. in 1660, enlarged the powers of the Company, giving it political and judicial authority in the factories and colonies established by it, with the right to appoint governors. It also altered its constitution, which had hitherto given only one vote to each member, by giving a vote for each £500 of stock. In the reign of James II., as a natural fruit of these exaggerated powers, the Company openly adopted aggressive designs, and sent a fleet to India to effect a forcible occupation of Chittagong. But the time was not come, and their Indian servants were compelled to make a humiliating submission to Aurengzebe, who forgave their crime, and permitted them to resume their trade.

On the Revolution of 1688 the Company was involved in new difficulties. James II. had been their greatest patron, and they stood upon the precarious ground of a royal charter, while Parliament had now become the supreme authority of the land. To defend the liberty of trade a new company was proposed, and the Dutch and the French had already got nearly a monopoly of the Indian markets. They succeeded, indeed, in getting a new charter from the crown; but the Commons, in 1692, presented an address to the crown praying for their dissolution. At this time, by an accidental failure to pay a tax upon their stock, the Company formally forfeited their charter, and were compelled to accept its renewal with the important proviso of a reservation to the crown of the right to alter or modify its conditions. This proviso was taken advantage of to make several important alterations. The maximum stock to be held by any individual was fixed at £10,000, every

£1000 of which was to give a vote, while the right of membership was thrown open to all British subjects. The opposition to the Company was not yet arrested, and they were still anxious to obtain parliamentary sanction; but a new difficulty arose, for, on the evidence of Sir Thomas Cooke, they were convicted of extensive bribery. Advantage was taken of those difficulties to inaugurate a new company in a quarter from which opposition was not anticipated. Scotland had hitherto been prevented by internal troubles from taking a direct share in the East India trade. The Scottish Parliament now sanctioned a company entitled the 'Company of Scotland trading to Africa and the Indies,' with mercantile and political privileges at least as extensive as those of the English company. A list of 1219 shareholders, and a capital of £400,000, gave the new company a formidable start compared with the humble beginning of its established rival. The English Parliament openly and bitterly opposed this encroachment upon English trade. The king himself, after sanctioning the act of Parliament, did not dare to support his Scottish subjects; and the proceedings of the agents of the new company involved them in a war with Spain. Under these accumulated difficulties the Scottish company succumbed. Meantime the misconduct of the English company had so strengthened its enemies, that, in spite of all its opposition, a resolution in favour of the formation of a new company passed the House of Commons on 4th May, 1698, and this company was actually constituted by Act 9 William III. cap. xiv. This act provided for the extinction of the old company. One condition of the act, however, was fatal to the independent existence of the new company. Its whole capital of £2,000,000 was, by the act, pledged as a loan to the government. This and the foreign establishments held by the old company led to negotiations, and finally the two companies were amalgamated by Act 6 Anne, cap. xvii., under the title of the United Company of Merchants of England trading to the East Indies. By this act a new loan of £1,200,000 was taken from the Company. The charter was made terminable on three years' notice after 1726. The arrangements between the two companies were left to the award of Lord Godolphin, which was pronounced on 29th September, 1708. The possessions of the old company at the time of amalgamation, upon which the valuation of £330,000 was placed in 1700, include 'the ports and islands of Bombay and St. Helena, with all their rights, profits, territories, and appurtenances whatsoever; under the presidency of Bombay are enumerated the factories of Surat, Swally, and Broach, where the Company have agents; and Amadavad, Agra, and Lucknow, where they have only buildings, &c. On the coast of Malabar are mentioned the forts of Carwar, Tellicherry, and Anjengo, and the factory of Calicut; in Peria the factories of Gombroon, Sheraz, and Ispahan; on the Coromandel coast, Forts St. George and St. David, with the surrounding territory; the factories of Cudalore, Porto-Novo, Pettipole, Melchilepatam (Masulipatam), Madappalam, and Vizagapatam; in Bengal, Fort-William, and the factory of Chuttanuttee and surrounding territories, the factories of Balasore, Cossimbuzar, Dacca, Hooghly, Moulta, Rajahmoul, and Patna. Possessions in Cochin-China, the island of Sumatra, &c., are also enumerated. A footing was thus already established in the three presidencies. The factory of Chuttanuttee or Chuttante, the future site of Calcutta, had only been acquired by a formal grant in 1695, after the humiliating submission to Aurengzebe. Each of the three presidencies was organised under a president and council, with independent powers. The act of the United Company

had made some important alterations in its powers. The constitution of the Company was restored to its early footing, according to which each proprietor could exercise only one vote, the limit of stock to be held by each proprietor being withdrawn, and £500 again constituted the minimum entitling to a place in the court of proprietors. This led the larger proprietors to divide their shares among nominal holders, so as to increase their influence. The directors were elected annually, and as they held valuable appointments at their disposal corruption began to enter largely into the conduct of the elections. The dividends of the Company, however, rose rapidly after the amalgamation, and finally settled at 8 per cent.; and it procured without difficulty, at various periods, a prolongation of its exclusive privileges until 1780, still with three years' notice. In the meantime the French company (see COLONY) had, as well as the English, been growing in power and importance in the East, and on the outbreak of the war of the Austrian Succession in 1744 commenced those struggles which were destined to end in the establishment of British supremacy over nearly the whole of India. We do not purpose here to give an outline of events which involve nearly the whole history of India and a great part of that of Europe during the period of their occurrence, and shall confine ourselves to the history of the organization of the Company which had so large a part in them. It is curious, however, to note with what reluctance, when their struggles with the French and the zeal of their own servants had led them into collision with the native powers, this mercantile company embraced the destiny which was forcing on them the position of great territorial magnates. In their instructions to the Council of Madras in 1768, after intimating the limits they wish to keep in opposition to French ascendancy, they say, 'If we pass these bounds we shall be led on from one acquisition to another till we shall find no security but in the acquisition of the whole, which, by dividing your force, would lose us the whole, and end in our extirpation from Hindustan.' 'It is not for the Company,' they add, 'to take the part of umpires of Hindustan.'

In 1766 the right of the Company to acquire territorial possessions formed, in consequence of recent acquisitions, a subject of parliamentary inquiry; and in the following year Parliament vetoed a resolution of the court of proprietors to raise their dividend to 12½ per cent. The question of the political rights of the Company being thus opened up, the ministry began to act on their view of it by sending out a crown plenipotentiary to India. After a protracted struggle at home and abroad, a regulating act was passed in 1778 remodelling the powers of the Company, and placing it completely under the control of Parliament. Instead of the twenty-four directors being elected annually, six were now to retire in rotation each year. £500 stock entitled a proprietor to attend the courts; £1000 gave one vote; £3000, two; £6000, three; and £10,000 or upwards, four votes. Provision was made to prevent the multiplication of votes by a fictitious distribution of shares. By this act the constitution of the councils of the presidencies was also regulated, and to the governor-general and council of Fort-William, in Bengal, was assigned the superintendence over councils of the presidencies of Madras, Bombay, and Bencoolen. The first members of the councils were named by the legislature, but future elections, after their term of office had expired, were left to the Company. The act provides for the establishment by the crown of courts of judicature in India. The charter, which expired in 1780, was renewed till 1791. The renewal act (21 George III. cap. lrv.) provided that the Company, which was already bound to submit to the government all de-

spatches received from India, should submit for approval all despatches proposed to be transmitted thither. A further modification of the political power of the Company was effected by an act (24 George III. cap. xxv.), which received the royal assent on 18th August, 1784. This act established a board, since known as the board of control, to superintend, direct, and control all acts, operations, and concerns relating to the civil and military government or revenues of India. The board was to consist of a principal secretary of state, the chancellor of the exchequer, and four privy-councillors nominated by the crown. As the first two members seldom attended, the senior of the appointed members came ultimately to be designated President of the Board of Control. The directors of the Company were bound to submit all their papers to this board, and obey its instructions. Commercial matters were not to be submitted to the control of the board; and his majesty in council was to decide without appeal whether any matter was included in this exception or not. In matters relating to peace and war, and to diplomatic negotiations, the instructions of the board of control were to be communicated to a secret committee consisting of three members appointed by the directors, and who were to withhold all knowledge of these instructions from the rest of the court. From this time the political power of the Company was little more than nominal. While the right of nominating the servants of the Company was still left to the directors, the absolute right of recall was vested in the crown. A subsequent declaratory bill (28 George III. cap. lxxviii.) regulated the power of the board of control to send out troops at the expense of the Company. By act 33 George III. cap. lii. the exclusive trade and revenue privileges of the Company were continued to them for twenty-four years from 1st March, 1794. A concession was made to the opposition of the large towns to the continuance of a commercial monopoly, requiring the Company to allow annually a certain amount of their tonnage for the accommodation of private trade. This concession was not deemed satisfactory; and as early as 1808 a select committee of the House of Commons was appointed to enter into the terms on which a renewal of the charter might be recommended. At first the government were disposed, on condition of throwing open the export trade, to give the Company the benefit of their warehousing arrangements by confining imports to London; but petitions continued to pour in in favour of the entire opening up of the trade, and the directors were unwilling to concede even what was required of them. Finally the charter was renewed in 1813 for twenty years from 10th April, 1814, in regard to territorial possessions, but the right of exclusive trade was restricted to China, and the India trade was thrown open to all British subjects under the restrictions that it must be carried on in vessels of not less than 850 tons register, and that imports should be admitted only to ports certified by orders in council. A church establishment for India was also provided by this act. The appointment of governors-general, governors, and commanders-in-chief were no longer to be valid without the direct sanction of the crown.

The renewal of the Company's charter in 1834 took place amid continued opposition to their mercantile, and even to their legislative privileges. It continued them in all their possessions except the island of St. Helena, put an end to the exclusive right of trade with China, and enacted that the Company should with all convenient speed close their commercial business, and make sale of all their property not retained for government purposes; all their other property was to be held in trust for the crown, which

was to take over their debts and guarantee their dividend out of the revenues of India. The stock was valued at £6,000,000, which was to bear interest at 10 per cent, and be redeemable after 30th April, 1874, on payment of £12,000,000; but if the Company should be deprived by authority of Parliament of the possession and government of India, it might, at any time after 1854, demand redemption at a year's notice. The anticipation contained in this act of an early close of its political existence was realized. On the outbreak of the mutiny of 1857 it was felt indispensable to vest the government of India directly in the crown. This was done in 1858, by act 21 and 22 Victoria, cap. cvi., by which the government of India and all the powers of the Company were assumed by the crown. Henceforth the Company existed only for the purpose of receiving payment of its capital, and of the dividends due upon capital until its repayment.

The anomaly of a vast empire being governed by a mercantile company is almost unprecedented in history, and such an anomaly could not exist without innumerable abuses. One of these, the corruption incident to the government of the Company itself, has been sufficiently indicated in this sketch. Another abuse to which, in fact, the rise of the British empire in India is in great measure due, was the almost unlimited power of the servants of the Company. On the spot, and familiar with the circumstances, these servants could not but frequently regard the instructions of their employers with contempt. They traded for themselves; they abused their power over the natives; and, finally, they embarked on a career of conquest, into which they were partly dragged by circumstances. They were unrestrained by the fear of a powerful authority at home, which would have kept in check the servants of a regular government, so that both the good and the evil that have resulted from this peculiar domination would probably have been restricted within narrower limits by a more vigorous home administration. The monopoly of trade so long held by the Company tended greatly to restrict the Indian trade, and to enrich individuals at the expense of the public; while from the impossibility of controlling so vast a monopoly the wealth thus diverted from the ordinary channels of trade did not flow into those which the monopolists had prepared for it. The Company was frequently reduced to financial difficulties, and brought sometimes to the brink of ruin, while its servants were enriching themselves at its expense. These inevitable evils made the cessation of the Company's powers, both commercial and political, only a question of time; but it must not be forgotten, that to this extraordinary institution, aided indeed by events which were neither anticipated nor desired by its promoters, Britain owes its Indian Empire. The government of India has now been placed under a special secretary of state, aided by a council of not less than ten members appointed for ten years, vacancies being filled up by the secretary for India. The majority of the council must be qualified by residence in India. The executive government in India itself is vested in the governor-general, or, as he is commonly called, the viceroy. See INDIA.

EAST INDIES, the name generally bestowed on India and south-eastern Asia, continental and insular, as far as the borders of China, including Ceylon and many other islands.

EASTLAKE, SIR CHARLES LOOK, President of the Royal Academy, was born at Plymouth, 17th November, 1798. He was for a short time a pupil in the Charterhouse, and entered the schools of the Royal Academy, where Haydon, a friend of his father, supervised his education. In 1815 he went

to France, but the commencement of the Hundred Days drove him to England, and he remained for some time in Plymouth occupied as a portrait-painter, where, when the *Bellerophon* arrived, he made a most successful portrait of the emperor. In 1816 he went to Italy, and for fourteen years his home was at Rome, his Italian life being broken by visits to England and Greece. Pictures of banditti and other subjects exhibited in England procured him the associateship of the Academy in 1827. *Pilgrims Arriving in Sight of Rome* (1828) became so popular that the artist became tired of repeating it in different versions. In 1830 he was made an R.A., his diploma picture being *Hagar and Ishmael. Escape of Francesco Carrara* (1834), *Gaston de Foix* (1838), *Christ Blessing Little Children* (1839), and *Christ Weeping over Jerusalem* (1841), were next among his noteworthy productions. *Helena* (1849), *Ippolita Torelli* (1851), *Violante* (1853), may also be mentioned. He translated Goethe's *Theory of Colours* (1840), and published in 1847 *Materials for a History of Oil-painting*. He became president of the Royal Academy in 1850, being knighted on the occasion; was keeper of the National Gallery in 1843-47, and director of the same institution from 1855 onwards. He died at Pisa, 14th December, 1865.

EAST LONDON, a seaport of Cape Colony, on the east coast, at the mouth of the Buffalo River, 85 miles s.e. of King William's Town, and about 600 miles from Cape Town by sea. The chief buildings are the town-hall, a building containing concert-room and public library, several churches, hospital, public schools, &c. Some of the streets are planted with trees, and the appearance of the town has been much improved of late. There is a race-course, a recreation-ground, and a public park known as the Queen's Park. The climate is healthy, and the neighbouring scenery very fine. As it is the terminus of a railway, with extensive harbour accommodation, it now forms an important outlet for the produce of this portion of the colony. Pop. in 1891, 6858.

EASTON, a city of the United States, capital of Northampton county, Pennsylvania, at the junction of the Delaware and Lehigh rivers, 75 miles s.w. from New York and 60 miles n. from Philadelphia, with both of which places it is connected by rail. It is the centre of a rich agricultural and mining district, and contains a silk factory, a shoe-factory, organ works, &c. It is the seat of La Fayette College. Pop. (1890), 14,481.

EAU, a French word, signifying *water*, and used in English with some other words for several spirituous waters, particularly perfumes. *Eau de Cologne* is a fragrant water, made originally and in most perfection in Cologne. Formerly many wonderful powers were ascribed to it, and numberless recipes have been given for its manufacture. It was invented by a person named Farina, in whose family the secret, as they say, continues to be preserved, since chemistry has not been able as yet to give the analysis of it. It is imitated, however, everywhere. There are various manufactures of it in Cologne, producing several millions of bottles yearly; much also is manufactured at Paris, in Saxony, and other places.

Eau de Luce, invented by a person named Luce, at Lille, in Flanders, is a volatile preparation, made from oil of amber, alcohol, and ammonia. It is a milky fluid, powerfully antispasmodic, and stimulant. Mixed with nitric acid it forms a substitute for musk. *Eau de Javelle* is the name given to the disinfecting and bleaching solution of chloride of potash, but this name is now often applied to a preparation of chloride of soda having similar properties.

EAUX-BONNES, a celebrated watering-place in France, département Basses-Pyrénées, at the bottom of a narrow gorge, about 25 miles south of Pau. The springs, which have a temperature of about 90°, are strongly impregnated with sulphur. About 6000 to 10,000 visitors resort hither in the course of the season, which lasts from June to October. The sulphur springs of Eaux-Chaudes are situated 4 miles to the north-west. Pop. (1891), 785.

EBAL, a mountain in Palestine, 35 miles north of Jerusalem, situated north of Mount Gerizim, from which it is separated by a narrow valley containing the town of Nablous, anciently Shechem. Here the Israelites were commanded, on their entrance into the Holy Land, to set up an altar of hewn stones. The fulfilment of this is recorded in Jos. viii. 30-35.

EBB. See **TIDES**.

EBBW-VALE, a town in the N.W. of Monmouthshire, England, 2 miles east of Tredegar, situated in a district which is rich in iron and coal deposits. It has important iron and steel works and large collieries. The chief buildings are the places of worship, especially Christ Church, and a Literary Institute. Pop. (1891), 11,137; (1901), 20,993.

EBENACEÆ, a natural family of plants, belonging to the group of corollifloral dicotyledons, consisting of non-lactescent trees and shrubs, of which the wood is very hard, and frequently of very dark colour in the centre, as ebony. The leaves are alternate, and generally coriaceous and shining. The flowers are commonly axillary, hermaphrodite, or unisexual; the calyx is monosepalous and persistent, with three or six equal divisions. The corolla is monopetalous, with imbricated divisions. The stamens are usually double or quadruple in number of the divisions of the corolla. The ovary has several cells, containing each one or two pendent ovules; the style is divided, the stigma simple or bifid. The fruit is a globular berry. The principal genera are *Diospyros*, which yields ebony and iron-wood (see **EBONY**), *Royena*, to which the African bladder-worts belong, and *Paralea*.

EBENEZER (Hebrew, the stone of help), the name of a field where, at Samuel's request, the Lord discomfited the Philistines with thunder, &c. On this occasion Samuel set up a stone, and gave it this designation, to indicate that the Lord had helped them. The site has not hitherto been definitely ascertained.

EBERS, **GEORG MORITZ**, Egyptologist and novelist, was born at Berlin on Mar. 1, 1837, and studied law and philology at Göttingen. About 1859 he began to devote himself almost exclusively to Egyptological studies, and in 1868 he was appointed extraordinary professor of the language, history, and antiquities of ancient Egypt at Jena. In the following year he travelled in Egypt, Nubia, and Arabia, and on his return in 1870 became ordinary professor of Egyptology at Leipzig. Another visit to Egypt in 1872-73 resulted in the discovery of the important medical papyrus, now known by his name. In 1889 ill-health caused him to give up the active discharge of the duties of his chair, and on Aug. 7, 1898, he died at Tutzing. Among his published contributions to Egyptology are *Disquisitiones de Dynastia vicesima sexta Regum Egyptiorum* (1865); *Ägypten und die Bücher Moses* (vol. i., 1868, not completed); *Durch Gosen zum Sinai* (1872); *Papyrus Ebers* (1875); *Eine Galerie antiker Portraits* (1889); *Die hieroglyphischen Schriftzeichen der Ägypter* (1890); and his *Ägypten in Bild und Wort* (two vols., 1878-79), translated into English as *Egypt, Descriptive, Historical, and Picturesque* (1880). Besides these works he published many novels, mostly dealing

with Egyptological subjects, among which we may mention *Eine Ägyptische Königsstater* (An Egyptian Princess, 1864); *Uarda* (1877); *Homo Sum* (1878); *Die Schwestern* (The Sisters, 1880); *Der Kaiser* (The Emperor, 1881); *Serapis* (1885); *Josua* (1889); *Per Aspera* (1892); *Kleopatras* (1894); and *Araohne* (1897). He also published a poem called *Elison* (1888), and an autobiography (1892), entitled *Die Geschichte meines Lebens*. A collective edition of his works was published at Stuttgart in 1893-97 in thirty-two volumes.

EBIONITES, a sect of the first century, so called from their leader, Ebion; but others derive the name from the Hebrew word *ebion*, meaning 'poor'. They held several dogmas in common with the Nazarenes, united the ceremonies of the Mosaic institution with the precepts of the gospel, observed both the Jewish Sabbath and the Christian Sunday, and, in celebrating the Eucharist, made use of unleavened bread. Some of them held that Christ was born like other men, of Joseph and Mary, but others of them, whilst allowing that he was born of a virgin, denied that he was the Word of God, or had any existence before his human generation. They said he was, indeed, the only true prophet; but yet a mere man, who, by his virtue, had arrived at being called *Christ*, and the *Son of God*. Of the New Testament they received as genuine only the Gospel of St. Matthew, and they regarded St. Paul as a corrupter of the truth.

EBLIS, in Moslem demonology, a jinn or spirit created out of smokeless fire, who was cast out of heaven for refusing to worship Adam because he was made of earth. He thenceforth reigned as chief of the devils. He is described as of enormous size, with a red-striped skin, a ring-pierced nose, long hair, large flapping ears, and a very long tail.

EBONITE, or **VULCANITE**, differs from ordinary vulcanized caoutchouc only in the larger proportion of sulphur it contains—from 80 to 60 per cent—and in the higher temperature at which it is made; but inferior qualities are produced by the addition of bitumen, heavy spar, shell-lac, and other impurities. It has a brownish black colour, is hard and tough, it cuts easily and takes a good polish, is therefore very largely used for making combs, brooches, bracelets, and a great number of other ornaments. It is not affected by water or by any of the usual caoutchouc solvents. As it becomes strongly electro-negative by friction, it has been much used in the construction of electric machines.

EBONY, a kind of wood, extremely hard and susceptible of a very fine polish, which is much used in mosaic, inlaying, and other ornamental works. Its colour is red, black, or green. The black is most esteemed, and is imported principally from Madagascar, Mauritius, and Ceylon. *Red ebony*, so called, though its colour is brown striped with black, is less compact, and is also brought from Madagascar. The green is softer than either of the preceding, yields a fine green tincture, which is employed in dyeing and is brought from the West Indies, particularly from Tobago, as well as from the above-mentioned islands. The best is jet black, and free from knots or reddish veins. Ebony is imitated by subjecting some hard kinds of wood, especially that of the pear-tree, to a hot decoction of galls, and, when this is dry, applying ink with a stiff brush; a little warm wax is then used to give it a polish. The ebony-tree (*Diospyros ebenus*) grows wild in the East Indies, and has been cultivated for many years in Mauritius, which supplies a great part of that consumed in Europe. The central part, or heart-wood, only is black; the sap-wood does not differ in colour from that of other trees. Several other species of the genus afford

; among them *D. decandra* and *dodecandra* of a-China, which are used in that country for cabinet-work, &c. The ebony which the Greeks used in the most ancient times was procured from India; but it was unknown in Rome till after the victories obtained by Pompey over Mithridates. The ancient inhabitants of India, the Greeks, and finally the Romans, made frequent use of this fine wood, inlaying it with ivory, on account of the contrast of colours. According to Pliny, the statue of Diana at Ephesus was of ebony, but according to Vitruvius, it was of cedar. Artists and poets used ebony allegorically for the attributes of the infernal, giving a throne formed of it to Pluto and Proserpine, and making the gates of hell of the same dark and durable material. It is used at the present day for sculptural decorations, embellished and inlaid with ivory, mother-of-pearl, silver, and gold.

EBRO (Latin, *Iberus*), a river in Spain, once the boundary between the territory of Rome and Carthage, has its source in the province of Santander, 10 miles w. by n. of Reynosa. Pursuing a south-east course it separates Biscay and Navarre from Old Castile, intersects Aragon and the south-east portion of Catalonia, and falls into the Mediterranean by two mouths in lat. 40° 40' n., after a course, including windings, of nearly 500 miles. It is navigable for boats up to Tudela, about 180 miles from its mouth, but is obstructed by shoals and rapids, to avoid which a canal, about 100 miles long, has been constructed south of and nearly parallel to the river.

EBULLITION. In ordinary language the term ebullition, or boiling, is applied to the commotion accompanied by escape of vapour which takes place when a fluid, such as water, is heated. But the escape of vapour from water depends not merely upon the temperature, but upon the presence of gases and other bodies, upon the vessel, and a variety of circumstances, so that a strict definition is necessary. The usual statement is that ebullition is the conversion of a liquid into a vapour or gas having the same tension or elastic force as the air. This conversion takes place at different temperatures for different substances, but it is so constant for each substance that the fixity of the boiling-point of a fluid is regarded as a very good test of its purity. In determining what that point is, it is of course necessary to ascertain what the atmospheric pressure is, to see that it does not vary during the experiment, and to fix upon some standard pressure for comparison of results. The pressure is estimated by the barometer, the standard length of the mercurial column being 30 inches (on the Continent 760 millimetres, or 29·922 inches). Accordingly, when aqueous vapour has an elastic force sufficient to balance a mercury column of this length, the water from which it issues is said to be in a state of ebullition, and this is what takes place at the temperature of 212° F. If now the pressure be diminished, the temperature required also falls, so that on the top of Mont Blanc the boiling-point falls to 182° F., and in a vacuum to 70° F. Strong spirit of wine, at the standard pressure, boils at about 176° F., chloroform at 142° F., bisulphide of carbon at 123° F., ether at 95° F., hydrofluoric acid at 68° F., chloride of ethyl at 55° F., liquid sulphurous acid at 14° F., that is, 18° below the melting-point of ice. At the ordinary temperature, therefore, sulphurous acid is a gas, and it requires but a slight alteration of temperature or pressure to change some of the liquids just mentioned into gases. See HEAT.

ECARTÉ, a game at cards for two persons. It is of French origin, and the terms used in it are generally French. It is sometimes played differently in

this country from the French mode, but the differences are not material. The game is played with a piquet pack, that is thirty-two cards, the small cards, from two to six, being excluded. For convenience of dealing, two packs are generally used. The players cut for the deal; the lowest card (in France the highest) deals. The dealer gives five cards to each player, three and two at a time, and turns up the eleventh card as trump (French, *atout*). If the turn up is a king he scores one, and if a king turns up in the hand of either player the holder may score one, but in each case this must be announced before the first trick by saying, 'I mark king.' The king is the highest card, the queen next, then knave, ace, ten, &c. Trump takes all other suits. In playing the non-dealer leads; the other player must follow suit, and take the trick if he can; if he cannot follow suit, he must play trump, if he holds one. The winner of the trick leads again till the five tricks are exhausted. Three tricks count one point, five tricks (in French, *vole*) two points. Five points make a game. The player, according to the French game, must announce the suit he plays, and if he plays differently, can be compelled to play as he announces, or if he cannot, as his adversary pleases. The leading speciality of the game, from which it derives its name, is, that before beginning to play the non-dealer may claim to discard (*carter*), that is, to set aside any of his cards with which he is dissatisfied, and have their place supplied with fresh ones from the pack. When this claim is made, by saying in English, 'I propose,' or in French, 'je propose,' 'je demande,' 'si vous voulez,' the dealer may either accept or decline. If he accepts, he says, 'How many?' (*combien*?) His adversary then names the number of cards he wishes to exchange, which the dealer hands him from the pack, the discarded cards are set aside on the left hand of the player. The dealer has then the privilege to set aside as many cards as he pleases, dealing himself new ones from the pack. If the elder hand (non-dealer) is not satisfied, he can claim another discard, which gives a similar privilege to the dealer, and so on till the pack is exhausted. The discarded cards can on no account be recalled, except that when one player has claimed a discard, and there are not cards enough left to allow the other player to discard, he may draw the number of which he is deficient from his own discarded cards. When the pack is exhausted, the game proceeds as already explained, and this is also done when either player declines a further discard; but in this case, whether the non-dealer declines to ask the discard or the dealer to grant it, the other player scores double for his tricks. The penalties and the mode of discarding sometimes vary from that here explained. In this country only one discard is sometimes allowed to each player, and in France the penalty is mitigated to one point, if he loses the odd trick after refusing any discard but the first. The game is usually played in rubbers.

ECBATANA, the chief city or ancient metropolis of Media, built, according to Pliny, by Seleucus. It was the summer residence of the Persian and Median kings, and existed in great splendour at a very early period in the history of the world. Its walls are described by ancient writers in a style of romantic exaggeration, and particularly by Herodotus and the author of the book of Judith. Daniel is said by Josephus to have built one of its most magnificent palaces, some of the beams of which were of silver, and the rest of cedar planked with gold. This splendid edifice afterwards served as a mausoleum to the kings of Media, and is affirmed, by the last-mentioned author, to have been entire in his time. There are no traces now remaining of these lofty buildings; and even the site of this cele-

brated city has become a subject of dispute among modern travellers. It was pillaged by the army of Alexander.

ECCE HOMO (Latin, Behold the man!). This name is often given to crucifixes and pictures which represent the suffering Saviour, because, according to John xix. 5, Pilate broke out in these words when Jesus came forth wearing the crown of thorns and the purple robe.

ECCHYMOISIS is the medical term applied to the extravasation of blood beneath the skin, or in the tissues of the body, whether resulting from a bruise or any other cause.

ECICIUS. See *Eck*.

ECCELESTASTES, one of the canonical books of the Old Testament. It is professedly written by Solomon, but its authorship has been questioned by Grotius and later critics. It is said to contain Aramaic words, and consequently to belong to a later period. The Sadducean theories of the book, and other objections, are likewise urged against its early origin. The critics, however, who object to the professed origin of the book have been unable to agree in fixing the period of its production, and perhaps the same methods of criticism might suffice to raise doubts as to any other origin that might be assigned.

ECCELESTASTICAL COMMISSIONERS, FOR ENGLAND, are a body corporate with a common seal, perpetual succession, and power to hold real estate, constituted by act 6 and 7 Will. IV. cap. lxxvii., 3 and 4 Vict. cap. cxlii., and 13 and 14 Vict. cap. xciv. It consists of all the bishops of England and Wales, the deans of Canterbury, St. Paul's, and Westminster; the chief-justices and other legal dignitaries, and several lay members. It has extensive powers in regard to the organization of the church, the distribution of episcopal duties, revenues, &c. The schemes adopted by the commission, on being laid before her majesty in council, approved of, and gazetted, acquire the force of acts of Parliament.

ECCELESTASTICAL CORPORATIONS (English law), corporations created for the furtherance of religion, and for the perpetuation of the rights of the church, the members of which are exclusively spiritual persons. They are of two kinds: corporations sole, viz. bishops, deans in peculiar, parsons, and vicars; and corporations aggregate, viz. deans and chapters. The ordinary is their visitor by common law. The crown, as supreme ordinary, is the visitor of the metropolitan or archbishop, the archbishop is the visitor of all his suffragan bishops, and the bishops of all the spiritual corporations in their dioceses.

ECCELESTASTICAL DIVISIONS OF ENGLAND. England is divided ecclesiastically into provinces, dioceses, archdeaconries, rural deaneries, and parishes. The provinces are two, Canterbury and York; the bishoprics (besides the two archbishoprics) are thirty-three, viz. London, Durham, Winchester, Bangor, Bath and Wells, Carlisle, Chester, Chichester, Ely, Exeter, Gloucester, Bristol, Hereford, Lichfield, Lincoln, Liverpool, Llandaff, Manchester, Newcastle, Norwich, Oxford, Peterborough, Ripon, Rochester, St. Alban's, St. Asaph, St. David's, Salisbury, Worcester, Sodor and Man, Truro, Wakefield, and Southwell. Gloucester was lately separated from Bristol, and it is intended to form a bishopric of Birmingham. Each bishopric is subdivided into archdeaconries, &c. There are two independent deaneries, those of Westminster and Windsor.

ECBALOT, or **SHALLOT** (*Allium ascalonicum*), a kind of onion, a native of Syria, being found abundantly near Ascalon (whence it derives its specific name), but which has been cultivated in Europe for some centuries. The bulbs are pungent, but of an agreeable taste, and much used in cookery.

EOHARD, LAWRENCE, an English divine and historian of the 18th century. He was born in Suffolk in 1671, and studied at Cambridge. He died in 1730. Among his works are, *The Roman History*, three vols. 8vo; *A General Ecclesiastical History*, two vols. 8vo, both works extending only to the age of Constantine; *A History of England to the Revolution*, three vols. folio; *The Gazetteer's or Newsmen's Interpreter*.

ECHELLES, LES ('the Ladders'), a village, France, department of Savoie, on the right bank of the Guier, 12 miles south-west of Chambéry. Pop. 798. The valley beyond the village is closed by a limestone rock 800 feet high. Originally the only mode of egress was to climb the precipice by means of ladders fastened to it, but a public road now passes through the precipice by a tunnel 25 feet in width and height, and nearly 1000 feet in length.

ECHELON (French, a ladder or stairway), used in military language. A battalion, regiment, &c., marches *en échelon*, or *par échelon*, if the divisions of which it is composed do not march in one line, but on parallel lines. The divisions are not exactly behind each other, but each is to the right or left of the one preceding, so as to give the whole the appearance of a stairway. This order is used if the commander wishes to bring one part of a mass sooner into action and to reserve the other. If the divisions of the *échelon* are battalions, these are generally from 100 to 200 steps from each other. An *échelon* is said to be *direct* if its head maintains a position perpendicular to the original line, as in direct attack or retreat; it is said to be *oblique* when it deviates from the line, as in changing the order of formation.

ECHENEIS, a genus or family of fishes, order *Malacopterygii sub-brachiiati*. Their speciality consists in having a disc on the head formed of transverse cartilaginous laminae, sloping backwards, and with spines on their posterior edge. By this disc the fish can attach itself firmly to a solid object, as it frequently does to a rock or the bottom of a ship. The body is long and scaly, with a small dorsal fin opposite the anal; the head is flat, with a projecting lower jaw and small teeth. *E. remora*, the common remora or sucking-fish, is abundant in the Mediterranean, where they frequently attach themselves to the bottom of vessels. The ancients attributed to them marvellous powers in arresting the motion of vessels. It was believed to be owing to one of them that Antony's ship was prevented from getting into action at the battle of Actium. They frequently attach themselves to other fish.

ECHIDNA, or porcupine ant-eater, an animal placed among the Monotremata (Ornithodelphia), showing, like the duck-mole (*Platypus*), certain curious resemblances to the birds. It has a globular skull, the thin, hard bones of which are early united, as in the bird, so that all trace of sutures has disappeared; the slender, elongated muzzle is naked and toothless. The bones of the shoulder and clavicle are arranged after the plan of birds and reptiles; and, as in these groups, the cavity which receives the head of the thigh-bone is incompletely ossified in the centre. The pelvic organs open, as in birds, into a cloaca or common chamber with the intestines; and (like the duck-mole) the Echidna is oviparous, laying a single egg, which is hatched in the mother's ventral pouch. The cochlea of the ear is not coiled, but bent on itself, as in some birds. These remarkable departures from the mammalian type have been explained on the hypothesis that the Ornithodelphia are descendants from the same stock as that from which birds and reptiles were an offshoot. The Echidna is found in New Guinea, but is best known in Australia and Tasmania. It is doubtful if the inhabitants of the

latter localities are distinct species, or only varieties, the *E. apurica* of Australia (see plate at MARSUPIA-LIA) having long spines and short hair, and being of a darker colour than *E. setosus*, the Tasmanian form, which has short spines and more abundant longer hair, the spines being also whiter. The latter is by some thought to be a variety adapted to the colder climate. The Australian Echinids is about the size of a hedgehog, which outwardly, though it has a much longer snout, it very much resembles. It can also roll itself up like the hedgehog. It has powerful digging feet, and burrows with rapidity; its food is insects, and these are obtained by thrusting the long slender tongue, which is covered with a viscid secretion, among its prey, just as the ant-eaters do. It has been successfully kept in captivity, being fed on hard-boiled eggs chopped up fine, chopped meat, liver, &c.

ECHINODERMATA. The animals included under this class are very dissimilar, the nearly spheroidal sea-urchin, with its hard calcareous test, standing at one end of the series, the disc-like star-fish in the middle, and at the other end the worm-like soft-bodied Holothurian, the sea-slug, species of which form the tripping or *bêche de mer*, a favourite food in the Pacific area. The star-fish and sea-urchin are the most familiar examples. The common cross-fish of our shores consists of five rays, whose bases form an acute angle with each other, the central portion or disc not being sharply defined. The upper surface has the integument flexible, with small calcareous particles scattered here and there: the under surface shows the arms to be traversed each by a groove, the five being radially disposed round the central mouth. The whole animal thus consists of two equal portions, the characteristic appearances being confined to the upper and lower surfaces. From the five grooves delicate tubular bodies project, terminating in a flattened disc; these are the ambulacral feet, which are alternately erected and allowed to collapse, being filled with water from a vascular system in the interior, which communicates externally by the madreporiform tubercle, a small perforated calcareous plate which may be seen on the upper surface of the body. Taking this tubercle and the mouth as convenient marks for the two surfaces, which may be called aboral and oral, the sea-urchin may be easily compared with the cross-fish. The mouth and tubercle are placed at what may be called the oral and aboral poles of the nearly spherical body, and in the living animal the ambulacral feet may be seen projecting no longer on the under surfaces of rays, but along five bands, which, from the resemblance to a terrestrial globe, may be called meridional. But these bands do not reach the pole; they leave around it an area which is the equivalent of the whole upper surface of the star-fish. The same excess of the ambulacral or oral surface over the aboral or antambulacral is seen in the Holothurians. The radial aspect is the first point which strikes the observer; but this arrangement is not fully carried out in the interior. The stomach of the star-fish is in the centre of the body above the mouth, and is prolonged by oesophageal processes into the arms, the genital organs occupying the space beyond their extremities; there is only one aperture to the digestive canal. But in the sea-urchin the intestine is spirally wound round the inner surface of the shell, and the vent opens at the apex of the shell. In the Holothurians it is likewise non-radial, as are also the reproductive organs. The nervous system consists of a ganglionated ring around the mouth, whence fibres follow the course of the ambulacral grooves. The water canals consist of an annular vessel surrounding the oesophagus, and of an axial trunk connecting this vessel with the madre-

poriform tubercle through which water filters into the canals. From the annular vessel trunks pass off and traverse the ambulacral lines, giving off on the one side the dilatible feet, on the other certain pear-shaped sacs by which the movements of the water are regulated, emptying as the feet are distended and conversely. A true vascular system exists in most adult Echinoderms, and follows the disposition of both alimentary and ambulacral systems. The skeleton consists of calcareous matter, which is either granular or spicular, as in some star-fishes and Holothurians; or consists of plates fitted into each other with wonderful regularity, as in the sea-urchins; nor is it confined to the integument: the internal canals and vessels also have calcareous matter deposited in their walls, and the patterns of these structures are often of value in identifying the animals whence they come. The integument further is set with spines, which are articulated to the skeleton of sea-urchins; with *pedicellariae*, or stalked organs, consisting of articulated calcareous plates which fold together pincer-like; or with *parilla*, brush-like tufts, whose functions are uncertain. But the most interesting of the hard parts is the lantern of Aristotle, a beautiful composite structure of radial character, which acts as a masticatory organ. It consists, in the urchins, of ten pieces united in pairs, so that each pair lodges in its hollow a slender calcareous rod of fine texture, and resembling the incisor tooth of a rabbit. Accessory pieces of various forms make up the number of parts to twenty-five, and the pyramidal mass is protruded, the points separated so that when they are approximated the five teeth cut out a conical piece. Because of their radial aspect the Echinoderms were placed among the Radiates of Cuvier, but the peculiarity of their development brings them into relationship with the thread-worms, tape-worms, and the other forms grouped under *Scolecida*, which, with Echinoderms, now make up the sub-kingdom *Annuloida*. The embryos are, in fact, bilateral, the cilia by whose action they at first roam about becoming restricted to certain bands which are symmetrically arranged. When the body is projected into processes, these also are symmetrically disposed. Within this larva, which in some groups, as the sea-urchins, acquires a calcareous skeleton, a complete intestinal canal is developed, which lies in the axis of the body, but its two apertures curve towards the ventral surface of the body. No other organs are seen. On one side of the dorsal surface of the body a depression takes place, whose walls thicken so as to form a mass of blastema, out of which the body of the adult is developed, while the depression becomes the ambulacral canal, with its ramifications. The new growth or blastema gradually enlarges and surrounds the larval intestine, which it appropriates, a new mouth and vent being formed, while those of the larva are either cast off with the rest of the larval skeleton, or, like it, slowly disappear by absorption. This remarkable process of secondary growth is wholly distinct from a sexual process. The form of the larva and the details of the changes are of value in classification. The Echinoderms are divided into eight orders, characterized as follows: 1. *Echinoidea*, the sea-urchins, whose body is spheroidal or discoidal, and built up of calcareous plates mutually united to each other, which form ten meridional bands, five being imperforate, and the alternate five perforated, to give outlet to the ambulacral feet. The larvae are pluteiform, and have a skeleton. 2. *Asteridea*, or star-fishes. The flattened body is stellate, the rays uniting at various angles so as to form a pentagonal disc, or a deeply cut star, having the mouth in the middle of one surface. The ambulacra are confined to and occupy the whole of that surface of the arms. The larvae are vermiform, and have no

skeleton. 3. *Ophiuridea*, or sand-stars. The body is a depressed, well-defined disc, from distinct points of which the arms are given off, and these are of different structure from the disc, consisting of vertebral ossicles surrounded by four plates, of which the ventral one covers the ambulacral vessel. The pluteiform larva have a skeleton. 4. *Crinoidea*, feather-stars, stone-lilies, encrinetes, &c. These forms, abundant in some of the older formations (as in the carboniferous), were, till recently, believed to be becoming extinct. The cup-shaped disc is supported on a longer or shorter stalk, which may be free or attached: the mouth is situated in the centre of the upper surface, opposite to the insertion of the stalk. The arms are composed of articulated plates, and give off lateral pinnules, which support the genital organs. The free-swimming larvæ develop within their bodies the ultimately stalked adult. 5. *Holothuridea*, or sea-slugs. The larva and adult are vermiform, and both want a skeleton, the adult having only calcareous spicules scattered in the skin. The ambulacral tubes pass from the oral to the aboral end. The wholly extinct orders are: 6, the *Cystidea*, which consist of a cup formed of suturally united plates, and supported on a stalk; at the apex of the ovoid body is a small aperture, and at one side a large one exists, closed by pyramidal plates; 7, the *Edriasteria*, which were not stalked; five ambulacral grooves radiated from the central mouth; 8, the *Blasioidea* were stalked, had ambulacra of complex structure, and apertures of unknown function between each pair. Several Echinodermata are shown in plate at the article MOLLUSCA.

ECHINUS, SEA-URCHIN, or SEA-EGG, a marine animal, the type of an order and a family of the class Echinodermata, inhabiting the seas of most countries, and subject to great variety in the species. *Echinus esculentus*, the edible sea-egg, is common on the coast of Europe, and is esteemed as an article of food. In systematic arrangements the genus *Echinus* of Linnaeus has been much divided, and is at present restricted to those species which have an orbicular, oval, or globular body, covered with spines, articulated on imperforate tubercles. These spines are very slightly attached, and fall off the dead animal on the least friction; in consequence, the specimens which commonly come under observation are deprived of them entirely. Five ranges of pores diverge from the centre, and tend towards the summit, dividing the shell into well-marked sections. The mouth is situated on the inferior surface, in the centre, and is armed with five osseous pieces or plates; anus superior. Many species are ornamented with a profusion of long and pointed spines, while in others they are quite short. These spines assist in locomotion, but the chief work is done by the ambulacral feet. (See ECHINODERMATA.) The apparatus of the mouth is provided with strong muscles, and is well calculated for crushing the hard portions of the animal's food. In the same species the colours vary considerably, the traits changing, however, on the death of the animal. Echini are said to retreat to deep water on the approach of a storm, and preserve themselves from injury by attaching themselves to submarine bodies. *E. melo* is perhaps the largest species known, and is found not uncommonly in the Mediterranean. Many fine species have been discovered in a fossil state imbedded in chalk, &c., in beautiful preservation. See ECHINODERMATA.

ECHO, a nymph (one of the Oreads), who, according to fable, was changed by Hera (Juno) into a rock, because her loquacity prevented Hera from listening to the conversation of Zeus with the nymphs. The use of her voice, however, was left her so far as to be able to repeat the last word which she heard from

others. Another account is that Echo fell in love with Narcissus, and because he did not reciprocate her affection she pined away until nothing was left but her voice.

ECHO. Echoes are caused by the reflection of sound-waves at some moderately even surface. The waves of sound on meeting the surface are turned back in their course according to the same laws that hold for reflection of light. Even clouds are capable of producing echoes, as is observed at sea when a gun is fired off under a dense cloud. Echoes from the clouds also, in all likelihood, play an important part in the long rolling of thunder. In order that the echo may return to the place from which the sound proceeds the reflection must be direct, and not at an angle to the line of transmission, otherwise the echo may be heard by others but not by the transmitter of the sound. This may be effected either by a reflecting surface at right angles to the line of transmission, or by several reflecting surfaces which end in bringing the sound back to the point of issue. To make a distinct echo the reflected sound must be concentrated rather than diffused. To this result a degree of concavity in the reflecting body is conducive. If the sound is repeated several times, which is the case when it strikes against objects at different distances, many echoes are heard. The reflecting surface must be at a certain distance, in order that the echo may come to the ear after the sound, and be distinctly separated from it. Sound travels about 1100 feet in a second; consequently, an observer standing at half that distance from the reflecting object would hear the echo a second later than the sound. Such an echo would repeat as many words and syllables as could be heard in a second. This is called a *polysyllabic* echo. If the distance is less, the echo repeats fewer syllables; if only one is repeated, then the echo is *monosyllabic*. The most practised ear cannot distinguish in a second more than from nine to twelve successive sounds, so that a distance of not less than 60 feet is needed to enable a common ear to distinguish between the echo and the original sounds. Echoes at least distances, as from the walls of churches and public halls, are liable to mix with and destroy the distinctness of the original sound. Any object at a sufficient distance on which a sound may strike and be reflected directly to its source will cause an echo; but the most imposing echoes are produced by combinations of such reflecting surfaces, by which sounds are concentrated and repeated. Woods, rocks, and mountains produce natural echoes in every variety, for which particular localities have become famous, and with which superstitious legends are often associated. The open walls of ruined and empty buildings likewise become famous for echoes, and in this as well as other ways become haunted with good and evil spirits. An ancient echo has always something venerable about it, and whether natural or artificial never fails to inspire respect.

ECIJA, a town of Spain, Andalusia, on the left bank of the Genil, here crossed by a handsome bridge, 42 miles E.N.E. Seville. It is of very ancient origin, and according to tradition was visited by the apostle Paul. At a very early period it became an episcopal see, and its importance under the Romans is attested by many ancient remains. It is surrounded by a dilapidated wall, and is in general poorly built, but has two magnificent palaces, several churches gaudily decorated, though of little architectural merit, and some fine shady walks, particularly acceptable in a climate so hot that it has been called the oven of Andalusia. Pop. in 1897, 23,992.

ECK, JOHANN MATY VON, the celebrated opponent of Luther, was born in 1486 at Eck, a small place in

Swabia, where his father was bailiff. Possessed of good talents, he early obtained, by the study of the fathers and schoolmen, a degree of learning and skill in disputation, which afterwards Luther and Melancthon themselves could not deny. He was Doctor of Theology, canon in Eichstätt, and pro-chancellor of the University of Ingolstadt, where for the first time, in 1518, he drew up, in opposition to Luther's theses, his Obelisk, which he had composed only for private use, at the request of the Bishop of Eichstätt. Being engaged by this production in a discussion with Karlstadt, he met Luther in 1518 at Augsburg, and arranged that the question should be decided by a public disputation with Karlstadt at Leipzig, but his vanity could not be satisfied without bringing Luther into the quarrel, and he accordingly attacked several of Luther's views in his programme for the disputation. The consequence of this learned tourney, which lasted from 27th June to 16th July, 1519, and in which Eck only proved himself a very clever debater, was a series of keen polemical tracts between him on the one side, and Luther and Melancthon on the other. Eck anathematized the Wittenbergers as Lutherans; and then, partly from personal hatred and partly at the instigation of Fugger, proceeded in 1520 to Rome to solicit strong measures against them. He returned with a condemnatory bull against Luther, and with permission to publish it, but met with violent opposition in many places, and in particular at Leipzig was forced to take refuge in the Pauline monastery. In 1530 he attended the diet of Augsburg, and there, in presence of Duke William of Bavaria, made the remarkable admission that he could confute the Augsburg Confession by the fathers, but not by the Scriptures. He took part in the refutation drawn up by the Roman Catholics, and also in the attempts made at this diet to bring about a reconciliation. These proved as fruitless as those afterwards attempted at the diets of Worms in 1540, and Ratisbon in 1541, at both of which Eck was present. He died in 1543. The desire to shine and play a conspicuous part appears to have been the strongest feature in his character. He is also suspected, from his connection with the Fugger family, to have been influenced by mercenary motives.

ECKHEL, JOSEPH HILARY, a learned Jesuit, who distinguished himself greatly by his works on coins, medals, and other remains of classical antiquity. He was born at Enzersfeld, in Austria, in 1737. After becoming a member of the society of St. Ignatius he was appointed keeper of the imperial cabinet of medals and professor of archeology at Vienna. He died in 1798. Eckhel may be regarded as the founder of the science of numismatics, the principles of which are elaborately developed in his treatise, entitled, *Doctrina Nummorum Veterum* (eight volumes, folio, 1792-98). He also published catalogues of the ancient coins and gems in the imperial cabinet, and other learned treatises.

ECKMÜHL, a village of Bavaria, circle of Lower Bavaria, on the Gross Laber, 13 miles S.E. of Ratisbon, the scene of a sanguinary battle between the French and Austrians, on 22d April, 1809. Austria had taken advantage of the occupation given by Spain to the arms of Napoleon to recommence the struggle against French ascendancy, which she had been compelled to abandon by the disastrous defeat of Austerlitz. On the 9th of April, immediately after the declaration of hostilities, the Austrian troops crossed the Inn and occupied Munich. The French, who had Bavaria, Saxony, and Würtemberg in their alliance, were posted chiefly at Ratisbon, Ulm, and Augsburg, with their head-quarters at Strauburg. Napoleon, who, in anticipation of this event, had returned from Spain, arrived on 18th April at Ingol-

stadt; on the 20th he defeated the Archduke Louis at Abensberg. On the same day the Archduke Charles took Ratisbon, which Davout had abandoned in order to join Napoleon, and moving along the right bank of the Danube, took up a position at Eckmühl. Napoleon pursued the Archduke Louis to Landshut, while Davout was engaged in a desperate attack upon the main army of the Austrians at Eckmühl. Advised by this general of the position of affairs, Napoleon turned upon the Archduke Charles, who sustained a decisive defeat, being cut off from the road to Vienna, and forced to retreat to the Upper Palatinate, while Napoleon advanced upon the Austrian capital, which surrendered on the 12th of May. Davout, who had sustained the brunt of the battle, was created Prince of Eckmühl.

ELECTICS (from the Greek *eklekikos*, select, from *eklegō*, to select) is a name given to all those philosophers who do not follow one system entirely, but select what they think the best parts of all systems. Their philosophy is called *eclectic*, and their method *eclecticism*. In the history of philosophy this term is chiefly applied to that sect of Greek philosophers who strove to unite and reconcile the opinions of Pythagoras, Plato, and Aristotle, and to bring them into one harmonious system. The Roman philosophy never got beyond the stage of eclecticism. Cicero, the most important of their philosophical writers, was not an independent thinker, but merely an able expounder of the views of preceding writers, such as Panætius and Poseidonius. In France, since the beginning of the present century, the term *eclecticism* has been applied to the philosophic method of Royer Collard and Victor Cousin, who endeavoured to correct the sensualistic tendency of the school of Condillac and Locke, then prevalent in France, by a return to the older philosophy of Descartes and Malebranche, and by appropriating from the philosophy of the Scottish and German schools everything kindred to that system of thought.

ECLIPSE.

An *Eclipse of the Moon* is a privation of the light of the moon, occasioned by an interposition of the earth between the sun and the moon; consequently, all eclipses of the moon happen at full moon; for it is only when the moon is in opposition that it can come within the earth's shadow, which must always be on that side of the earth which is from the sun. The earth being in the plane of the ecliptic, the centre of its shadow is always in that plane; if, therefore, the moon be in its nodes, that is, in the plane of the ecliptic, the shadow of the earth will fall upon it. This shadow being of considerable breadth is partly above and partly below the plane of the ecliptic; if, therefore, the moon in opposition be so near one of its nodes that its latitude is less than half the breadth of the shadow, it will be eclipsed. But because the plane of the moon's orbit makes an angle of more than 5° with the plane of the ecliptic, it will frequently have too much latitude at its opposition to allow it to come within the shadow of the earth.

An *Eclipse of the Sun* is an occultation of part of the face of the sun, occasioned by an interposition of the moon between the earth and the sun; thus all eclipses of the sun happen at the time of new moon. The dark or central part of the moon's shadow, where the sun's rays are wholly intercepted, is called the *umbra*, and the light part, where only a part of them are intercepted, is called the *penumbra*; and it is evident that if a spectator be situated on that part of the earth where the umbra falls, there will be a total eclipse of the sun at that place; in the penumbra there will be a partial eclipse, and beyond the penumbra there will be no eclipse. As the earth is not always at the same distance from the moon, if an

eclipse should happen when the earth is so far from the moon that the rays of light proceeding from the upper and lower limbs of the sun cross each other before they come to the earth, a spectator situated on the earth in a direct line between the centres of the sun and moon, would see a ring of light round the dark body of the moon; such an eclipse is called *annular*; when this happens there can be no total eclipse anywhere, because the moon's umbra does not reach the earth. People situated in the penumbra will perceive a partial eclipse; and an eclipse can never be annular longer than 12 minutes 24 seconds, nor total longer than 7 minutes 58 seconds; nor can the duration of an eclipse of the sun ever exceed 2 hours.

The sun being larger than the earth, the earth's shadow is a cone, whose base is on the surface of the earth, and the moon is eclipsed by a section of the earth's shadow. If the earth were larger than, or equal to the sun, its shadow would either perpetually enlarge or be always of the same dimension; and in this case the superior planets would sometimes come within it and be eclipsed, which never happens, as the shadow does not extend to the orbit of Mars. An eclipse of the moon is *partial* when only a part of its disc is within the shadow of the earth; it is *total* when all its disc is within the shadow; and it is *central* when the centre of the earth's shadow falls upon the centre of the moon's disc. Now the nearer any part of the penumbra is to the umbra, the less light it receives from the sun; and as the moon enters the penumbra before she enters the umbra, she gradually loses her light, and appears less brilliant. The duration of an eclipse of the moon, from her first touching the earth's penumbra to her leaving it, does not exceed five hours and a half. The moon does not continue in the earth's umbra longer than three hours and three-quarters in any eclipse, neither is she totally eclipsed for a longer period than one hour and three-quarters. As the moon is actually deprived of her light during an eclipse, every inhabitant upon the face of the earth who sees the moon sees the eclipse. An eclipse of the sun, as we have said, happens when the moon, passing between the sun and the earth, intercepts the sun's light; and the sun can only be eclipsed at the new moon, or when the moon, at its conjunction, is in or near one of its nodes. For unless the moon is in or near one of its nodes, it cannot appear in or near the same plane with the sun; without which it cannot appear to us to pass over the disc of the sun. At every other part of its orbit it will have so much northern or southern latitude as to appear above or below the sun. If the moon be in one of its nodes, having no latitude, it will cover the whole disc of the sun, and produce a total eclipse, except when its apparent diameter is less than that of the sun: if it be *near* one of its nodes, having a small degree of latitude, it will only pass over a part of the sun's disc, or produce a partial eclipse. In a total eclipse of the sun the shadow or umbra of the moon falls upon that part of the earth where the eclipse is seen, and a spectator placed in the shadow will not see any part of the sun, because the moon will intercept all the rays of light coming directly from the sun. In a partial eclipse of the sun a penumbra, or imperfect shadow of the moon, falls upon that part of the earth where the partial eclipse is seen. Were the orbit of the earth and that of the moon both in the same plane, there would be an eclipse of the sun every new moon, and an eclipse of the moon every full moon. But the orbit of the moon makes an angle of $5\frac{1}{2}^\circ$ with the plane of the earth's orbit, and crosses it in two points, called the *nodes*. Astronomers have calculated that if the moon be less than $17^\circ 21'$ from either node at the time of new

moon, the sun may be eclipsed; or if less than $11^\circ 54'$ from either node, at the full moon, the moon may be eclipsed; at all other times there can be no eclipse, for the shadow of the moon will fall either above or below the earth at the time of new moon; and the shadow of the earth will fall either above or below the moon at the time of full moon. An eclipse of the sun begins on the western side of his disc and ends on the eastern; and an eclipse of the moon begins on the eastern side of her disc and ends on the western. The average number of eclipses in a year is four, two of the sun and two of the moon; and as the sun and moon are as long below the horizon of any particular place as they are above it, the average number of visible eclipses in a year is two, one of the sun and one of the moon. See *ASTRONOMY*.

ECLIPTIC, the sun's path, the great circle of the celestial sphere, in which the sun appears to describe his annual course from west to east. The Greeks observed that eclipses of the sun and moon took place near this circle; whence they called it the *ecliptic*. By a little attention we shall see that the sun does not always rise to the same height in the meridian, but seems to revolve round the earth in a spiral. (See *DAY*.) We likewise observe every day, at its rising and setting, new stars in the neighbourhood of the sun. It will also be seen that the sun is in the equator twice a year, about March 22 and September 22. The points of the equator at which the sun is stationary on these days are at the intersection of the equator with the ecliptic. June 21 the sun reaches its greatest height in the heavens, and December 21 it descends the lowest. Because the sun appears to turn back at these points they are called the *tropics*, and the times at which the turning appears to commence are called *solstices* (*solstitia, solis stationes*). At these points the sun has attained its greatest distance from the equator. These four points, the equinoctial and solstitial points, are distant from one another a quarter of a circle, or 90° . Each of these quadrants, or quarters of a circle, is divided into three equal arcs of 30° ; thus the whole ecliptic is divided into twelve equal arcs or signs: these receive their names from certain constellations through which the ecliptic passes, and which extend each 30° . The constellations, or twelve celestial signs, succeed one another in the following order, from the vernal equinox, reckoned towards the east:—

♈ Aries, March 20.	♏ Libra, September 23.
♉ Taurus, April 20.	♐ Scorpio, October 23.
♊ Gemini, May 21.	♑ Sagittarius, Nov. 22.
♋ Cancer, June 21.	♒ Capricornus, Dec. 21.
♌ Leo, July 22.	♓ Aquarius, January 19.
♍ Virgo, August 23.	♈ Pisces, February 18.

The days of the month annexed show when the sun, in its annual revolution, enters each of the signs of the zodiac. The 30° in every sign are divided into minutes and seconds, not reckoned separately, but after the signs. An arc of the ecliptic, for example, of $97^\circ 15' 27''$, reckoned from Aries eastward, is called three signs, $7^\circ 15' 27''$ lon., or, what is the same thing, it terminates in $7^\circ 15' 27''$ of Cancer. In this way the longitude of the stars is given. The ecliptic, like all circles, has two poles, which move about the poles of the earth every twenty-four hours, and in this manner describe the polar circles. What appears to be the path of the sun, however, is in reality the path of the earth. The planets and the moon revolve in different planes; but these are inclined at only a very small angle to the plane of the ecliptic; hence these bodies can be but a small distance from the ecliptic. The plane of the ecliptic is very important in theoretical astronomy, because the

courses of all the other planets are projected upon it and reckoned by it. By the obliquity of the ecliptic we understand its inclination to the equator, or the angles formed by the planes of these two great circles. This angle is measured by the arc of a third great circle, drawn so as to intersect the two others perpendicularly, in the points at which they are farthest apart. The ancients endeavoured to measure the obliquity of the ecliptic. According to Pliny, it was first determined by Anaximander; according to Cassendi, it had been ascertained by Thales. The most celebrated measurement of this obliquity in ancient times was made by Pytheas, at Marseilles. He found it, 350 a.c., to be $23^{\circ} 49' 23''$. A hundred years later, according to Ptolemy, Eratosthenes found it to be $23^{\circ} 51' 20''$. Various measurements have subsequently taken place, even down to our own time; and it is remarkable that almost every measurement makes the angle less than those which preceded it. Among the modern estimates are that of Cassini, $23^{\circ} 28' 35''$; of Lacaille, $23^{\circ} 38' 19''$; of Bradley, $23^{\circ} 28' 18''$; and of Mayer, $23^{\circ} 28' 16''$; the observations of Delambre, Maskelyne, Piazz, Bessel, and others, give this important astronomical element, for the year 1800, at $23^{\circ} 27' 56''$. In respect to the decrease of the inclination of the ecliptic, the most celebrated astronomers of our time, as Lalande, adopted the opinion that this decrease continues uninterruptedly. Louville determined the annual decrease to be $1'$, La Caille $44''$, and Lalande $33''$. Several philosophers of modern times concluded, from these observations, that the equator and the ecliptic were formerly in the same plane, that the shock of a comet, or some mighty revolution on the earth, gave the axis of our planet this inclination, and that for thousands of years the axis has been returning to its original position, which it will reach after 180,000 years. Laplace, on the contrary, in his *Mécanique Céleste*, showed that this will never take place, but that the decrease of the angle between the planes of the equator and the ecliptic depends merely upon a periodical effect, arising from the action of the other planets; that, after a certain time, it will increase again, and that the limits of variation are narrow and fixed. A very long space of time will be required to make satisfactory observations respecting this fact. The inclination of the ecliptic is subject to another change, which makes it increase and decrease alternately for nine years, during which time the greatest difference amounts to $18'$. The combined result of these two changes is to cause the pole of the earth not to point constantly to the same spot in the heavens, but to describe an undulating circle round a certain point; but this movement is so slow that it takes many thousand years to complete it. See NUTATION and PRECESSION.

ECLOGUE, in poetry, a select piece of any sort; in general the name is given to poems of the same form; thus the satires of Horace were called *eclogues*. Since Virgil's *Bucolics* received this name (from grammarians probably, and not from the poet), the term *eclogues* has usually been applied to what Theocritus called *idyls*—short, highly-finished poems, principally of a pastoral nature. See IDYL.

ÉCOLE DES BEAUX ARTS, that is, School of Fine Arts, the government school of the fine arts at Paris, which was founded by Mazarin in 1648. In 1803 very considerable alterations were made in the management and constitution of this school. The management, which had previously been in the hands of the Academy, was transferred to the government, and the teachers, who had formerly been divided between two departments, one comprising painting and sculpture, and the other devoted to architecture, were now classed as *professeurs chargés de cours*, or

those engaged to teach the regular branches in the course of instruction, and *chefs d'atelier*, or superintendents of the work-room. Further changes were introduced in 1833, more especially in the direction of widening the course of study, lectures being now instituted on mathematics, descriptive geometry, physics and chemistry, general history, the history of art and æsthetics, archaeology, and literature. The competitions for the *grands prix de Rome* take place at this school. All artists between the ages of fifteen and twenty-five, whether pupils of this school or not, are open to compete. The competitions in painting, sculpture, and architecture are annual, those in plate engraving are held every two years, and those in engraving medals and precious stones every three years. A single prize is awarded in each branch. The successful competitors in the first four branches receive an annual allowance from the state for four years, and those in the last branch for three years, this period being passed at Rome.

ÉCOLE NORMALE SUPÉRIEURE, a school at Paris for the training of those teachers who have the charge of the higher education in France. It was originally created in 1794. During the first session there were 1500 pupils, all young men above twenty-one years of age, who had already received a good education, and who had been chosen by the departmental administrations. Among the teachers were some of the most distinguished scholars and men of science in France, such as Lagrange, Laplace, Haüy, Daubenton, Berthollet, La Harpe, &c. On finishing their course the pupils left Paris charged with the duty of establishing similar schools for the education of teachers in their own districts. Napoleon I., by the decree of 1808, and the regulations of March 30 and May 29, 1810, organized a new *École Normale*, for the reception of pupils of the lycées of above seventeen years of age, who were to be educated free of cost for the teaching profession. The curriculum extended over two years, during or at the termination of which they were expected to take a degree either in the department of literature or of science. The restoration caused few alterations to be made in the *École Normale*; the chief change then made was the increase of the length of the curriculum to three years. At a later period, however, the school was suspected of fostering sentiments hostile to the government, in consequence of which it was suppressed in 1822, and an attempt made to supply its place by an *École préparatoire*. In 1830 the *École Normale* was re-established, on which occasion V. Cousin revised the course of study, and introduced considerable changes. The chief change was the institution of annual competitions among the pupils, the best of whom belonging to each year were admitted free of charge, while the others were required to pay 500*fr.* (220) towards defraying the cost of their education. The revolution of 1848 again opened the school to all pupils free of charge. Various changes have since been introduced. Pupils are admitted to the school annually by competition according to the number of vacancies that are declared to exist. They must be of the age of eighteen years at least and twenty-four at most, and must give an undertaking to devote themselves to public instruction for ten years. The course extends over three years, and differs according as it comes under the division of literature or that of science. The number of pupils is about 180. In 1880 a corresponding institution was established for training female teachers for the normal schools of France.

ÉCOLE POLYTECHNIQUE, a school in Paris, established with the purpose of giving instruction in matters connected with the various branches of the public service, such as mines, roads and bridges, en-

gineering, the army and the navy, government manufactures, &c. It was founded under the name of the École centrale des Travaux publics, by a law of the convention dated 7th Vendémiaire of the year III. (Sept. 28, 1794), and accordingly exactly one month before the École normale supérieure, on the suggestion of Lamblardie, director of the École des Ponts et Chaussées, and with the aid of Monge, Carnot, and Prieur. It was originally intended to furnish instruction only in civil and military engineering. The pupils were required to be of French nationality, and between sixteen and twenty years of age. At a later time the maximum limit of the age at which pupils were admitted was extended to twenty-five for those in the military department. The length of the curriculum was three years. Among the original professors were Lagrange, Prony, Monge, Hachette, Delorme, Balthard, Fourcroy, Vauquelin, Berthollet, &c. The school gave admission originally to 400 pupils. A law of Sept. 1, 1795, gave it its present name; and another of the 22d Oct. of the same year defined the relations between it and the special schools for the separate branches taught in the former, reduced the number of pupils to 800, and made the length of their course greater or smaller according to the profession adopted by the pupil. The curriculum for all was afterwards limited to two years, which is its present duration. At first the pupils were not required to live within the school buildings, but in 1805 a radical change was made in the organization of the school. The pupils were required to live in the school buildings, and were organized as a military corps. They were also obliged to provide themselves with books, instruments, and everything else they should want, and to pay yearly 800*fr.* (€32) to the state. This sum was afterwards raised to 1000*fr.* (€40). The school was originally placed under the direction of the minister of the interior, but it afterwards passed under that of the minister of war. New regulations relating to this school were issued on the 1st and the 25th of Nov. 1852, but these in the main confirmed those previously existing. The pupils who, on quitting the school, pass satisfactory examinations are admitted into the public service. A list of the situations open to them is made out, and each pupil in order of merit has the right of sending a notice to the administration, stating in their order those branches of the service for which he has most inclination.

EOTHLIPSIS, in Latin prosody, the elision of *as* at the end of a word with the preceding vowel, before another word beginning with a vowel or the letter *h*.

ECUADOR, an independent republican state in South America, lying under the equator, whence it takes its name. It lies between about 4° 30' *s.*, and 1° 40' *n.* lat., and 78° and 81° 40' *w.* lon. Its greatest length from Cape San Lorenzo on the *w.* to the *lon.* 78° *w.* is 540 miles, and the area of the state, as ascertained by planimetric calculation, is 115,645 square miles, or, including the Galapagos Islands, 118,585 square miles. Ecuador is at present divided into sixteen provinces; the four largest towns are Quito, Guayaquil, Cuenca, and Loja. This state embraces every variety of climate, having *tierras calientes*, or low tracts, insufferably hot; *templadas* or temperate regions, from 6000 to 9000 feet above the sea; *frias*, or cold districts, extending from the upper limits of the preceding to the borders of the *paramos* or cold deserts, lying between the elevation of 11,000 feet and the limits of perpetual snow; and finally, the *nevadas* or snowy heights themselves. The culminating summits in this part of the Andes are ranged close together in double file, or along the outer edges of a narrow elevated longitudinal ridge, in the hol-

lows of which is collected the chief population of the state. On the west of this ridge the declivities of the Cordilleras are covered with dense forests. On the east also impenetrable forests occupy the mid region, between the temperate heights and these interminable and periodically desert plains below, here called by the Spanish name *Llanos*, and which resemble the pampas and savannas of other regions. The central ridge or elevated region of Ecuador is formed by a double range of snow-clad mountains—several of them active volcanoes—which inclose a longitudinal valley, varying in elevation from 8800 to 18,900 feet, and divided by transverse barriers. The most elevated of these mountains are on the western range, Chimborazo, Illiniza, Casalagua, Cotacachi, Pichincha, Corazon, Atacasho; on the eastern range, Cayambí, Antisana, Cotopaxi, Llanganates, Altar, Rincónagua, and Sangai. The average height of the mountains on the western range is lower than on the eastern, but the highest mountain of all is Chimborazo (20,703 feet) on the western range. On the plain of Quito, 9300 feet above the sea, there reigns a perpetual spring, with a temperature so constant that even the snow line on the surrounding mountains seems hardly to vary throughout the year. The absolute height of the line of perpetual congelation is here about 15,700 feet, which is considerably lower than in Bolivia, where, owing to the dryness of the climate, the fall of snow is scanty. At Quito the rain is abundant, falling generally for a few hours in the afternoon, and rarely so constant or so heavy as to mar seriously the enjoyment derived from the usually bright sky and delicious atmosphere. Further south, in Loja, and east in the plains, there is less rain than at Quito; while on the opposite direction, at Barbacoas, it rains nearly every day in the year. The country round Guayaquil is inundated to a great extent in the rainy season (July), after which it remains for some months a pestilential marsh, from which issue incredible multitudes of mosquitoes and other noxious insects, and reptiles. Cotopaxi, though not the highest, is the most celebrated and conspicuous peak in this most remarkable region of the Andes. It attracts the eye at once, being a perfectly symmetrical truncated cone, presenting a uniform, unfurrowed field of snow of resplendent brightness. It is not to its beauty, however, that it owes its celebrity, but to its terrific eruptions, which, recurring frequently in the course of the last and the beginning of the present century, totally changed the face of the south part of the valley of Hambato, overturned the towns or buried them under scoris and ashes. Babamba was destroyed in 1797 by an eruption of Tunguragua, when the rivers, dammed up by masses of rock falling from the mountains, swept away every vestige of the town. Great numbers of the inhabitants perished on that occasion. Pichincha, which, previous to the Spanish conquest, was an active volcano, rises immediately above the plain of Quito. Its crater is 3 miles in circumference, and may be viewed by a spectator from the precipitous rocks which form its rim. Thus seen it appears to be nearly on a level with the plain of Quito, or about 6000 feet, or 1½ mile deep, and is quite black within, while its upper edges are covered with snow.

The cultivated land and the population of Ecuador lie chiefly in the valley, which extends along between the summits of the Cordillera, and which may be considered as divided by transverse ridges or dykes into the valleys of Quito, Hambato, and Cuenca. The average height of this tract is about 9000 feet above the sea, though at its south extremity, at and beyond Loja, it sinks about 3000 feet. The chief rivers are naturally on the eastern slope of the Cordillera, and among them are the Napo, the Orenayo, the Pa-

tama or Pastaza, and other streams, the waters of which all find their way either directly or indirectly to the Marañon. They are for the most part rapid, and interrupted by rocks and shallows, quite unavailable for purposes of internal communication. Perhaps one or two of the largest, as the Napo and Pastaza, might be navigated by flat-bottomed steamers of special construction; but at present commerce derives no aid from their navigation. On the west or maritime side of the mountains, among the chief rivers are the Esmeraldas, and the river of Guayaquil, formed by the junction of the Caracol or Guayas and Daule, both navigable for some distance. The estuary of this river, being protected towards the sea by the large island of Puna, forms a secure and capacious harbour. This island is remarkable as being the landing-place of Pizarro, when he led his men to the conquest of Peru.

Among mammalia Ecuador possesses the puma, jaguar, monkeys of several species, various kinds of deer, as well as tapirs and peccaries. Parrots and humming-birds are also numerous, but perhaps the most remarkable of the birds in Ecuador is the condor, which dwells on the slopes of the Andes. On the sea-coast life is apt to be rendered miserable by the stings of flies and other insects. Reptiles are abundant in the forests, and alligators in the streams. The botanical productions of this country are many and intrinsically valuable, but not absolutely peculiar to it, and they are consequently excluded in some degree from commerce by the competition of countries (such as Colombia and Venezuela) which are nearer to the European markets, and have greater facilities of internal communication. The cinchona bark of Loja is of the best kind, and was formerly in general demand; but the price now paid for it barely defrays the expense of carrying to the sea-coast. The cocoa of the same locality and of the coast near Guayaquil is excellent, and finds a ready sale. Rice, pepper, tobacco, and wheat are among the other products. Agriculture is in a very backward state.

Of the population, the aboriginal red race, or Peruvians, as they may be called, speaking the Quichua or some cognate language, form more than half; the rest are negroes, mulattoes, mestizoes, zambos, a degenerate breed of mixed negro and Indian blood, and whites, the last a small minority. The whites or Spanish Creoles are the chief possessors of the land; the civilized Indians form the great body of the labouring classes, and produce almost all the articles that are exported. According to the latest estimate the inhabitants of the sixteen provinces numbered 1,270,000. The commerce is unimportant; the chief port suitable for foreign trade is Guayaquil. In 1897 the number of foreign vessels that entered this port was 192 (100 British) of 265,208 tons burden; the river craft and coasting vessels had an aggregate burden of 20,700 tons. The most important article of commerce is cocoa, which partly grows wild, but is also cultivated in the hot maritime districts. This article was exported from Ecuador in 1897 to the value of £960,081 (in 1890 the value was £1,078,064). The other chief exports are coffee, India-rubber, Peruvian bark, hides, sugar, ivory-nuts, &c. The total exports from Ecuador in the year 1897 were valued at £1,217,628, and the total exports to Britain in 1899 were £175,501. The total imports from Britain in 1899 were £416,408. Mining and manufactures are unimportant. The latter are confined almost exclusively to weaving for home consumption, and to the plating of the so-called Panama hats and other articles. Education is free and compulsory, and there is a university at Quito, with university colleges at Cuenca and Guayaquil. The religion is Roman Catholic, and there is one archbishopric,

Quito, and six bishoprics. Slavery was abolished in 1854. A line of railway 68 miles long has been constructed between Duran (opposite Guayaquil) and Chimbo, and the length of telegraph line is 1200 miles.

The present constitution dates from 1884, although it has been modified since. The government is vested in a president elected for a term of four years, the method of election being directly by the people. He is assisted by a vice-president, besides a council, of which, in addition to the ministers of state, the president of the supreme law-courts and others are members. The congress is the legislative body, and consists of two houses, one formed of thirty senators, the other of thirty-three deputies, both elected by universal suffrage. The congress has extensive privileges, and cannot be dissolved by the president. The seat of government is at Quito. The annual revenue has lately been over £880,000, mostly raised from customs dues. There is a considerable public debt, interest on which has not been well paid.

The territory belonging to the present Republic of Ecuador, at the time of the conquest of Peru by the Spaniards, formed part of the great empire of the Incas. After this period the civilization of the inhabitants very rapidly declined, and the towns and admirable roads, which, laid out on a uniform plan, led over the passes of the Andes, sometimes to a height exceeding that of Mont Blanc, fell into decay; but the remains of these royal roads or causeways, as well as of the Tambos or palaces, still attest the perseverance, grandeur of design, and careful workmanship of the natives. From 1532 till 1822 Ecuador was under Spanish government, and formed first a part of the viceroyalty of Peru, then, from 1564 till 1718, an independent presidency, and from the latter date part of the presidency of New Granada. When New Granada declared its independence in 1811, Ecuador took part in the revolutionary war against Spain which followed, and its own independence as a part of the Central Republic of Colombia was secured in 1822. After much internal strife and bloodshed Ecuador erected itself in May, 1830, into a separate republic under General Juan José de Flores. The subsequent history of Ecuador forms an uninterrupted series of revolutions and wars with neighbouring states, especially with Peru. Latterly there have been frequent disputes with Peru and Colombia in regard to boundaries, Ecuador laying claim to large tracts of territory at present held by these republics. If these claims were admitted to the full extent the area of Ecuador would probably be doubled, and the state would possess a valuable territory on both sides of the upper Amazon.

ECZEMA, a disease of the skin, marked by an eruption of small vesicles, preceded by redness, heat, and itching of the part. In course of time the minute vesicles burst, and discharge a thin acrid fluid, which often gives rise to excoriation. The most severe form of this disease arises from the effects of mercury on the system, but the disease is likewise caused by exposure of the skin to irritating substances. It frequently occurs on the hands of grocers from working amongst raw sugars, and is then named 'grocer's itch'. It also occurs amongst bricklayers, masons and others, from the effect of the lime on the skin. The best treatment is frequently bathing the parts affected in tepid water, and the application of emollient poultices.

EDAM, a town of North Holland, near the Zuyder-Zee, 12 miles N.W. of Amsterdam, and about a mile from the western shore of the Zuyder-Zee, with which it is connected by a canal. Pop. (1899), 6444. This place is chiefly noted for its trade in cheese, of which nearly 1,000,000 lbs. are annually

sold in its market. The Edam is all sweet-milk cheese, which is divided, according to its colour, into red and white. The town was once fortified, and has still walls with seven gates.

EDDA (meaning 'great grandmother'), the name given to two ancient Icelandic works, the one consisting of mythological poems, the other being in prose. They are the chief source of the mythology of the gods and heroes of the north of Europe. The first of these collections, called the *Older or Poetic Edda*, was compiled in the thirteenth century. For a long time an earlier date was given, the compiler being erroneously believed to have been Sæmund Sigfússon, a learned Icelandic clergyman who lived about 1056 to 1133. In 1843 the best copy extant of this older collection was found and rescued from decay by Bishop Brynjulf Svendsen. It consists of thirty-three pieces, written in alliterative verse, and is divided into three parts, the first of which contains tales of the Scandinavian gods and goddesses, making a tolerably complete mythology of the Ases (see *NORTHERN MYTHOLOGY*), and particularly narratives of the exploits and adventures of the three chief Scandinavian deities, Odin, Thor, and Freya; the second contains the songs relating to the Scandinavian heroes, and especially celebrates the achievements of Sigurd and his ancestors; and the third is the dogmatic portion of the work, containing the elements of the religious faith of the ancient Scandinavians. In the song of Sigurd in the second part can be traced the origin of the legend of the Nibelungen. According to the results of the latest German criticism on this subject the majority of these poems are assigned to a period later than the ninth century, and seem to have arisen at different dates, from the ninth to the eleventh century. The prose *Edda*, or *Younger Edda*, which contains a great deal about the Scandinavian mythology, with dissertations on the language and metres of the Icelandic poets, and numerous extracts, was based on these poems, then complete, and other ancient songs. It is usually ascribed to Snorri Sturluson, born in Iceland in 1178, and who was assassinated there in 1241 on his return from Norway, where he had been scold or court poet. The first part of the *Older Edda* was printed in the original text, accompanied by a Latin translation, in 1787, by the *Magnean Institute*, under the title of *Edda Sæmundar Hins Froða, Pars I. (Edda of Sæmund the Wise, part i.)*. The second part was published in 1818, by the *Magnean Institute*, containing the *Volundarquida*, and all the poems which form the connection between the Scandinavian and German heroic era. The third part, containing the *Voluspá*, the *Hávamál*, and the *Rígmál*, was published in 1828. The standard edition is that of Sophus Bugge, 1867. The best edition of the *Younger Edda* is that which was published with a Latin version in three volumes at Copenhagen, 1848–57, at the expense of the *Arna-Magnean Institute*. Translations of both the *Eddas* are numerous. English translations of the *Older Edda* are those of Thorpe and E. B. Anderson. A translation of the *Younger Edda* by Dasent appeared in 1842; a German translation of both *Eddas* by Simrock in 1851; and a complete literal version of both *Eddas* into French was published by M. Léonun-le-Duc in 1868.

EDDYSTONE ROCKS, well known to seamen who navigate the English Channel, consisting of three principal ridges, and extending 600 or 700 yards in length. They lie nearly in the fair way from the *Start* to the *Lizard*, and are therefore an object of the utmost importance to mariners. Hence it is, that on the summit of the largest rock a lighthouse has been erected, to serve as a beacon or signal to avoid the danger, as they are covered at the flood

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tide, but become dry at the ebb. It is situated 15 miles s.w. of Plymouth, 45 m. of *Lizard Point*; lon. 4° 16' w.; lat. 50° 10' 54" n. The swell at these rocks is tremendous. After a storm, when the sea is to all appearance quite smooth, and its surface unruffled by the slightest breeze, the ground-swell or under-current, meeting the slope of the rocks, often causes the sea to rise above the lighthouse in a magnificent manner, overtopping it as with a canopy of foam. Henry Winstanley, between 1696 and 1700, built the first lighthouse, but, in 1703, perished with it in a storm. Another lighthouse stood from 1709 till 1755, when it was burned. The third, by the celebrated Smeaton, was finished in 1759. This tower withstood the storms of considerably over a century, when it was found that the rocky foundation was being gradually undermined by the sea. In May, 1832, a new lighthouse, built from designs by Sir J. N. Douglass, chief engineer to the *Trinity Board*, at a short distance from Smeaton's, was inaugurated by the Duke of Edinburgh. It is built entirely of granite. The focal plane of its light is 138 feet above high-water, the light being visible 17½ miles. The old lighthouse, which was visible for 13 miles, has been re-erected on Plymouth Hoe.

EDEN, the original residence of the first human pair. The account given in *Genesis* of the situation of Eden is not such as to enable us to identify it with any existing locality. It is said to have had a garden in the eastern part of it, and we are told that a river went out of Eden to water this garden, and from thence it was parted into four heads, which were called respectively Pison, Gihon, Hiddekel, and Euphrates (Phrat). The Pison is said to compass the whole land of Havilah; the Gihon that of Ethiopia (Cush); and the Hiddekel to go toward the east of Assyria. Of the rivers mentioned the Phrat of the original seems to have been correctly identified with the Euphrates, and the name Hiddekel appears elsewhere in Scripture (*Dan. x. 4*) to be applied to the Tigris; but it is impossible to say what rivers or places were meant by the names Pison, Gihon, Havilah, and Cush. It was not the whole of Eden that was assigned to man for his first habitation, but the part towards the east to which the translators of the Authorized Version have given the name of the Garden of Eden, and which Milton, in *Paradise Lost*, calls *Paradise*, that word (originally Persian) having in its Greek form (*paradeisos*) been applied to the Garden of Eden by the translators of the Septuagint.

EDEN, a river in England, rising in a hill in Westmoreland, near the n.w. boundary of Yorkshire; flows n.w., crossing Westmoreland and Cumberland, passing Appleby and Carlisle, and falls into the Solway Firth. Total course, in a direct line, 40 miles.

EDENTATA, or TOOTHLESS ANIMALS, the name of an order of Mammalia, though, as a descriptive term, it is only properly applied to the ant-eaters and the pangolins or scaly ant-eaters. The remainder are merely destitute of teeth in the front of the jaws. The teeth, however, are destitute of enamel, do not have complete roots, and are not replaced by a second set. This order is also characterized by the presence of great claws surrounding the ends of the toes, and more or less approximating to the nature of hoofs. It is divided into two sections, the first comprehending the sloths, which subsist on vegetable food, and the gigantic fossil animals the *Megatherium* and the *Megalonix*; and the second including the armadillos and the ant-eaters, which live mainly on insects, though some of the armadillos eat other sorts of animal food, and also vegetables.

EDESSA, the name of two ancient cities.—1. The ancient capital of Macedonia, and the burial-place of its kings, now *Vodhena*. It is probably the same

with the still more ancient Aega. The seat of government was afterwards transferred to Pella.—2. An important city in the province of Osrhoëne, in the north of Mesopotamia, is supposed to have been founded by Seleucus, one of the successors of Alexander the Great, although some carry it back to a very ancient period, and hold that it owes its origin to Nimrod. It was governed by a race of native princes or kings, who were dependent first on the Seleucids, and afterwards on the Roman emperors. Subsequent to the establishment of Christianity it became celebrated for its theological schools, which were largely resorted to from all quarters. Edessa is also famous in ecclesiastical history for the pretended epistle addressed by Jesus Christ to one of its kings. In 1098, in the first Crusade, Edessa came into the hands of Baldwin, afterwards king of Jerusalem. This Edessa is thought to be the modern Orfah or Urfa.

EDFOO (ancient, *Apollinopolis Magna*), a town in Upper Egypt, on the left bank of the Nile, 54 miles S.W. of Thebes. It is now a poor place, composed chiefly of mean huts, but its ancient magnificence is attested by several remains, especially two temples, one of which, dedicated to Noun, is the largest in Egypt, after those of Karnak and Luxor. The sculptures on the smaller temple represent the birth and education of Horus, an Egyptian deity, whose parents were Kneph and Athor. From the masses of rubbish around and within it, it cannot be easily inspected, but its form is very regular, and its general effect grand and imposing. The modern Edfoo has a pop. of about 2000.

EDGAR (THE PEACABLE), one of the most distinguished of the Saxon kings of England, was the son of King Edmund. He succeeded to the throne in 958, and managed the civil and military affairs of his kingdom with great vigour and success. He maintained a body of troops to control the mutinous Northumbrians, and repel the incursions of the Scots, and fitted out a powerful navy to protect his subjects from the Danes. By these precautions he not only prevented invasion from the Danes, but secured the submission of the independent provinces of Wales and Ireland, and the surrounding islands. During the reign of Edgar wolves were nearly extirpated from the southern parts of the island, by exchanging a tribute from Wales for payment in the heads of these animals. He married Elfri, daughter of the Earl of Devonshire, in 965. It was during his reign that Dunstan was primate of England. He died in 975, and was succeeded by his son Edward the Martyr.

EDGAR ATHELING, grandson of Edmund Ironside, and son of Edward the Outlaw, was born in Hungary, where his father had been conveyed in infancy, to escape the designs of Canute. After the battle of Hastings, Edgar (who had been brought to England in 1067) was proclaimed king of England by the Saxons, who still showed front against William, but was afterwards constrained to make his submission to the latter, who conferred on him the earldom of Oxford. Having been concerned in some combinations of the English nobles against William, he retreated with his two sisters, Margaret and Christina, to Scotland, where, in process of time, the former became the wife of King Malcolm Canmore. Malcolm espoused the cause of his brother-in-law, and on two different occasions led an army into England to enforce his claims to the crown, but both attempts proved failures. Edgar subsequently effected a reconciliation with William, and was allowed to take up his abode at Rouen, where a pension was assigned him. He was afterwards permitted to return to England by William Rufus, and with his sanction under-

took an expedition to Scotland for the purpose of displacing the usurper Donald Bane, in favour of his nephew Edgar, son of Malcolm Canmore, and in this object he succeeded. On the accession of Henry I. he joined Duke Robert of Normandy in his ineffectual attempt to assert his rights, but was taken prisoner at the battle of Tenchebray. Henry seems to have entertained too contemptuous an opinion of him to subject him to any severe treatment, and he was accordingly allowed to spend at large in England the remainder of his days. The time of his death is unknown. He was both weak in body and feeble in intellect, and never being an object of dread or uneasiness to any of the Norman kings, was thereby throughout life secured from their violence.

EDGRIFFILL, an eminence in Warwickshire memorable as the place where the royal forces were drawn up on the occasion of the bloody but indecisive battle fought on Sunday, October 25, 1842, between the Royalists under Charles I. and the forces of the Parliament under the Earl of Essex.

EDGEWORTH, MARIA, a celebrated authoress, was born at Hare Hatch, near Reading, Berkshire, on January 1, 1767. In 1782 her father, Richard Lovell Edgeworth, succeeded to the family estate of Edgeworthstown, in the county of Longford, Ireland, and thither he proceeded and took up his abode. In 1802 she established her position as an authoress by her *Castle Rackrent*, a novel of Irish life, in which the manners and customs of a by-gone generation are most graphically and humorously described. A *Treatise on Irish Bulls* appeared in 1808, and about the same time commenced a series of tales of various descriptions, which were continued for many years, and are probably the structures on which her fame with posterity will rest. These comprise *Moral Tales*, *Popular Tales*, and *Tales of Fashionable Life*, all written in the clearest and most vigorous style, without the least affectation of sentiment or fine writing, and yet conveying unmistakably the impress of a highly educated and reflecting mind. Reference must also be made to the *Parents' Assistant*, that charming collection of tales for children, and the well-known series of *Early Lessons*, *Harry and Lucy*, *Frank*, and *Rosamond*. Belonging to the class of regular novels are *Belinda*, *Leonora*, *Patronage*, *Harrington*, and *Ormond*. Up to her father's death in 1817 all Miss Edgeworth's publications bore to be in co-operation with him, though almost all his share in their composition was restricted to a superficial revision and the pruning away of a few redundancies. In 1823 she made a journey to Scotland, and paid a visit of a fortnight to Sir Walter Scott at Abbotsford, which was subsequently returned by him at Edgeworthstown. She died on 21st May, 1849, at Edgeworthstown. The first collected edition of Miss Edgeworth's works was published in London in fourteen vols. in 1825. Other editions appeared in 1832, 1848, and 1856. A complete list of the contents of the last-mentioned edition is contained in Lowndes' *Bibliographer's Manual*. In estimating Miss Edgeworth's merits as an authoress, too much praise cannot be given to her terse and nervous style, alike simple and elegant, or to the lucidity and consecutiveness which characterise all her compositions. Her skill in plot is considerable, and the interest excited in the characters and issue of the story is never allowed to flag.

EDIBLE BIRDS' NESTS. See *BRIDE'S NEST*.

EDICT, a public proclamation. In ancient Rome, the higher officers of state, who were elected annually, publicly declared, at their entrance upon office, the principles by which they should conduct their administration. This was done particularly by the *sediles*, who superintended buildings and markets, and by the *prætors*, as supreme judges. These an-

annual proclamations, by which the deficiencies of the general statutes were supplied, and the laws were adapted to the peculiar wants of the period, gradually acquired a certain permanency, as each officer retained, unaltered, most of the regulations of his predecessor (*edictum tralatitium*); and they became, in fact, the source of that branch of Roman law which, being founded on the official authority of the authors, was called *jus honorarium*, and was opposed to the strictly formal law, *jus civile*. Edicts were sometimes made for some special occasion, in which case they were called *edicta repentina*. It was against the abuse of this kind of edicts that the *Lex Cornelia* in B.C. 67 was directed. Those which were applicable in all cases during the tenure of office of the magistrates who issued them were called *edicta perpetua*. The name of *edictum perpetuum* was also given to a collection and arrangement of the clauses which the prætors were accustomed to put into their annual edicts, made under the Emperor Hadrian by Salvius Julianus about 181 A.D. What the exact nature of the work thus done by Julianus was is not known, but the edict prepared by him, and sanctioned by imperial authority, had unquestionably a special force, and it is likely that it restricted in future the right enjoyed by magistrates of issuing edicts, to such cases as were not provided for in the edict of Julianus. Only a few fragments of the ancient Roman edicts have been preserved.

EDICT OF NANTES. See NANTES.

EDINBURGH, EDINBURGSHIRE, or MIDLOTHIAN, a maritime county of Scotland, bounded N. by the Firth of Forth, along which it extends from 11 to 12 miles; N.W. by the county of Linlithgow, N.E. Haddington, E. Berwick, and S.W. and S. by portions of Lanark, Peebles, Selkirk, and Roxburgh. Its extreme length, E. to W., is 35 miles; its greatest breadth, N. to S., 24 miles. Of the total area of 231,724 acres, rather more than half is under cultivation, besides a considerable area in permanent pasture, meadow, woods and plantations, &c. The chief corn crops are oats and barley; and the chief green crops turnips and potatoes. The S.E. and S.W. parts of the county are diversified by hills, of which the two principal ranges are the Pentlands and Moorfoot, the former stretching from S.W. to N.E. into the centre of the county, from Peebles to within 4 miles of Edinburgh. The views from some of the higher elevations of the Pentlands, looking towards the N. and N.W. are very fine. The county is watered by several rivers, but none of much importance. The principal are the North and South Esks and the Water of Leith. The banks of the two former are remarkable for their picturesque beauty. Edinburghshire rests on a series of strata connected with the coal formation. Coal, limestone, and sandstone are extensively wrought throughout the whole district. In the hilly parts, particularly in the south-east, the climate is cold but healthy; in all other places it is the same with that of the adjoining coast, subject to dry and cold east winds in spring. The soil is greatly varied, but consists chiefly of a clayey loam, alternating with sand and gravel. It is not generally remarkable for natural fertility; the richest portions are the low lands towards the Forth, where the most luxuriant crops are obtained; and the valley watered by the North and South Esks, where vegetation is rapid, early, and abundant. The agricultural farms are of considerable size, varying from 100 to 400 acres; the farm buildings substantial and well arranged, generally of stone; the implements of husbandry of the best and most approved description; and the lands well drained and inclosed. A large portion of the county,

however, is under pasturage, chiefly the south and hilly parts. Considerable attention is paid to the management of dairy-farms, of which the principal produce is milk and butter for the supply of Edinburgh; most of the dairy-farms are in the western part of the county. The manufactures of the county are comparatively limited, but include ale, long celebrated; whisky, to a considerable extent; gunpowder and paper, especially along the banks of the North Esk, which may be considered the principal seat in Scotland of paper manufacture. The county communicates by the Union Canal with the Forth and Clyde Canal; is intersected by numerous excellent roads, and by sundry railways, all of which centre at the capital. The chief towns are Edinburgh, capital of Scotland, Leith, Dalkeith, Musselburgh, and Portobello. The county is divided into forty-six parishes, and returns one member to the House of Commons. Pop. in 1871, 328,379; in 1881, 389,164; in 1891, 434,541; in 1901, 488,647.

EDINBURGH, the metropolis of Scotland, and one of the finest, as well as most ancient cities, in the empire, lies within 2 miles of the south shore of the Firth of Forth, distant from London 388 miles; from Glasgow 42 miles; and from Aberdeen 105. It is picturesquely situated, being built on three eminences which run in a direction from east to west, and surrounded on all sides by lofty hills except on the north, where the ground slopes gently towards the Firth of Forth. The central ridge, which constituted the ancient city, is terminated by the castle on the west, and Holyrood Palace on the east, near which rise the lofty elevations of Salisbury Crags, Arthur's Seat, and the Calton Hill. The valley to the north of this ridge formerly contained the North Loch, which is now drained, and traversed by the Edinburgh and Glasgow branch of the North British Railway. On the rising ground beyond this valley stands the New Town. The city (excluding Portobello), within the new municipal limits, extends about five miles from east to west and about four from north to south; and, when viewed from the Calton Hill, presents an unrivalled panoramic scene. On the north-west are the splendid lines of streets of the New Town, constructed of white freestone, and spreading down with moderate descent towards the sea. Westward extends the vista of Princes Street, nearly a mile in length, and on the south-west rises the huge unbroken line of tall structures forming the Old Town, terminated by the towers of the castle. Beyond and towards the south the town is seen to spread out in lines of streets and detached houses, till arrested by the inclosures towards the Braid Hills, or on the east by Arthur's Seat and Salisbury Crags. Towards the north the view from the Calton Hill is also striking, comprehending a prospect of Leith, the Firth of Forth, and the hills of Fifeshire.

The New Town occupies a ridge of much broader crest and less abrupt ascent than that occupied by the Old Town, from which it is separated by the hollow which formerly contained the North Loch. The slopes on both sides of the hollow are laid out as public gardens, and the railway here is crossed by two bridges and an earthen mound. The mound was formed from the earth and rubbish dug from the foundations of buildings in the New Town. The houses here, all built of a beautiful white freestone from quarries in the vicinity, are comparatively modern and remarkably handsome; many of the squares, crescents, &c., being magnificent. The streets, with a few exceptions, are spacious and regular, and are kept in excellent order. Extensive and well laid out pleasure grounds, and the command of beautiful views from various points,

complete the attractions of this elegant quarter of the city. On the south side of the Old Town, and separated from it also by a hollow, occupied by an ancient street called the Cowgate, and crossed by two bridges, stands the remaining portion of the city. With the exception of a few unimportant streets this is also a comparatively new town. The finest houses and streets in this part of the city are those in the southmost districts of Newington, Grange, and Morningside. The city has of late years been stretching out rapidly in this direction as well as to the west, where many fine streets have been formed. The principal street in the Old Town is that which occupies the crest of the central ridge, and which bears at different points the names of Canongate, Netherbow, High Street, Lawnmarket, and Castle Hill. This ancient and very remarkable street is upwards of one mile in length, rising gradually with a regular and steep incline from a small plain at the east end of the town, on which stands the palace of Holyrood, and terminating in the huge rock on which the castle is built, 383 feet above sea-level. The appearance of this street, the scene of many interesting historical incidents, is rendered exceedingly imposing by the loftiness and antique aspect of the houses with which it is lined, most of them ranging from five to seven stories in front, and often more behind. On the right-hand side, going east, the High Street opens into Parliament Square, where stand St. Giles's Church, the ancient Parliament House, and the County Hall. To the west of St. Giles stands a monument to Walter, late Duke of Buccleuch and Queensberry, erected in 1888; while the ancient cross of Edinburgh, removed in 1756, but restored in 1885 by the late Mr. W. E. Gladstone, member for the county, now stands near the east end of the church. At the east corner of the Parliament Square stands the police office, and opposite the cross on the north side of the street the municipal buildings, erected by Lord Provost Drummond in 1756. Lower down, on the right side, is the Tron Church. Farther on is the site of the Netherbow Port, one of the ancient gates of the city, and near it on the left side the house in which John Knox lived. The main street, now taking the name of Canongate, extends to Holyrood House. From the High Street descend laterally in regular rows numerous narrow lanes called *closes*, many of them extremely steep, and very few, at their entrances, more than six feet wide; those which are broader, and admit of the passage of carriages, are called *wynds*. In these and the adjacent streets the houses are frequently more than 120 feet in height, divided into from six to ten stories, or, as they are locally termed, *flats*, each flat being inhabited by two or more families, the entrance to all the different dwellings being from the common staircase. Among the streets in the New Town most worthy of notice are Princes Street, George Street, and Queen Street, all lying parallel to each other, east and west. Princes Street runs along the edge of the hollow which separates the New Town from the Old. Being built only on the north side, a magnificent view of the Old Town, towering dark and high on its rocky ridge, of the lordly castle, and the intervening valley, is obtained, rendering it one of the most delightful promenades of which any city can boast. At the east extremity of this street rises the Calton Hill, one of the most striking features of this singular city, a rocky eminence studded with monuments, with a broad verdant summit, commanding a view of the Firth of Forth, with its shipping and surrounding shores, of surpassing beauty. Beyond the east extremity of the town a huge belt of precipitous rock, called Salisbury Craigs,

rises to the height of nearly 580 feet above the level of the sea. Immediately behind, a conical hill, with a narrow rocky summit, called Arthur's Seat, towers above the crags, attaining an elevation of 822 feet. A broad pathway winds along the face of the Craigs, and a carriage drive leads round the entire hill, from many points of which beautiful prospects are obtained.

In the Old Town the most remarkable and the most interesting public building is the Castle, the position of which has been already described. The fortress contains accommodation for 2000 soldiers. On a small flagged area, occupying the highest summit of the Castle, stands St. Margaret's Chapel, the most ancient edifice in the Castle, erected by Margaret, the Saxon Princess, wife of Malcolm Canmore, near the close of the 11th century. In front of it, on a space called the Bomb Battery, stands conspicuously a huge piece of ancient ordnance called *Mons Meg*, built of malleable iron staves, cask fashion, and believed to have been forged at Mons, in Flanders, A.D. 1486, though Sir Walter Scott and other archaeologists suppose it to have been made near Castle Douglas. At the east end of the lofty range of ancient buildings on the south-east side of the castle is the small apartment in which Queen Mary gave birth to James VI. in 1566, and in an adjoining room are kept the ancient regalia of Scotland, found in the year 1818 in an old oaken chest, where they had lain undiscovered for upwards of a century. West of Queen Mary's rooms with a southern elevation stands the old Parliament Hall, restored by the late Mr. William Nelson in 1888-89. These ancient buildings, in conjunction with a group of more modern edifices to the west and north, form a quadrangle called the Palace Square. Since June 7, 1861, a gun on the castle has been fired every day (except Sunday) precisely at one o'clock. The gun is fired by an apparatus in connection with a clock on the castle, which is in electric communication with the observatory on Blackford Hill. The palace of Holyrood stands, as already mentioned, at the lower or east extremity of the street leading to the castle. No part of the present palace is older than the time of James V. (1528), while the greater portion of it dates only from the time of Charles II. In the north-west angle of the building are the apartments which were occupied by Queen Mary, nearly in the same state in which they were left by that unfortunate princess. On the area in front stands a handsome stone fountain, designed after one which stood in the court of Linlithgow palace. Adjoining the palace on the north side are the ruins of the chapel belonging to the Abbey of Holyrood, founded in 1128 by David I., the only portion of that establishment now remaining. A privilege of sanctuary for insolvent debtors is attached to this abbey, and extends over Arthur's Seat, &c., but has ceased to be of any value. The Church or Cathedral of St. Giles, the tutelary saint of the city, situated in the High Street, is a large, ancient and imposing edifice in later Gothic style, with square tower and lantern spire, forming a conspicuous feature in views of Edinburgh. The exterior was renovated, with questionable taste, in 1829-32, the interior was carefully restored at the cost of Dr. William Chambers in 1883. The Parliament House, now forming the vestibule of the Court of Session—the supreme civil court of Scotland—is the place in which the Scottish Parliament used to meet. It is a magnificent hall, 122 feet long by 49 feet broad, with a lofty, open, timber roof, and contains marble statues of Duncan Forbes of Culloden, the first Lord Melville, Lord Dundas, and others. Adjoining it is the Advocates' Library, the largest library in Scot-

land, containing upwards of 300,000 printed volumes and 3000 MSS. It is one of the libraries entitled to a copy of every book published in Great Britain. In an adjoining building is the Signet Library, belonging to the Writers to the Signet, and containing about 90,000 volumes. In the vicinity, on George IV. Bridge, is the Free Library, erected 1887-89 at the expense of Mr. Andrew Carnegie, of Pittsburg, United States. Among the other buildings of note in Edinburgh are the Royal Institution, a beautiful Grecian edifice erected for the accommodation of the Royal Society of Edinburgh and other bodies; the National (Picture) Gallery, built in the Ionic style, and situated behind the Royal Institution; the Scottish National Portrait Gallery, in Queen Street, a Venetian Gothic building erected by the late Mr. J. R. Findlay at an initial cost of £50,000—the building accommodates also the extensive collection belonging to the National Museum of Antiquities; the Physicians' Hall in Queen Street; the Assembly-rooms and Music Hall in George Street; the Register Office, with an equestrian statue of the Duke of Wellington in front; the General Post Office; the Museum of Science and Art; the Theatre Royal; the University buildings; the fine large Episcopal Cathedral of St. Mary's, with its lofty spire, opened in 1879 (cost about £110,000); the Tron Church; the Sheriff Court buildings; the Royal Exchange; the Corn Exchange; the Bank of Scotland; the New or Free Church College (theological); the buildings of the University Students' Union; the Jail and Bridewell; the High School, a splendid Doric edifice; the Royal Astronomical Observatory on Blackford Hill; the new Infirmary, one of the largest in the kingdom, opened in 1879; the Waverley Market, the roof of which is laid out as an ornamental flower-garden; the various club-houses; &c., &c.

The most striking of the public monuments of Edinburgh is that to Sir Walter Scott, on the south side of Princes Street. Its form is that of an elaborate Gothic cross, 200 feet high, and it was designed by George M. Kemp, a self-taught genius. A marble seated figure of the novelist and poet, by Steell, occupies the platform of the monument, and over it the groined arches form a canopy. Other noteworthy monuments in the city are those to Robert Burns, David Hume, Allan Ramsay, James Watt, Lord Melville, and the Prince Consort memorial. There are also bronze statues of the Earl of Hopetoun, Professor Wilson, Dr. Livingstone, Dr. Chalmers, Sir J. Simpson, George IV., and William Pitt (the last two by Chantrey). On the esplanade in front of the castle are a statue to the Duke of York, and several regimental memorials, and on the Calton Hill monuments to Lord Nelson, Dugald Stewart, and Playfair, the mathematician.

The more prominent educational institutions of Edinburgh are the University (see next article); the new Medical School; a dental school, and two veterinary colleges; the New or Free Church College; the U.P. Divinity Hall; the Edinburgh High-school; the Edinburgh Academy; the Fettes College, an endowed high-school; the Training Colleges for teachers of the Established, Free, and Episcopal Churches; the Royal Scottish Academy of Painting, Sculpture, and Architecture; the Watt Institution and School of Arts, established in 1821 for the higher instruction of the industrial classes, known as the Heriot-Watt College since its association with the Heriot Trust; and Heriot's Hospital, founded by George Heriot, goldsmith and jeweller to James VI., for the maintenance and education of poor children, but administered on a reorganized basis

since 1885. (See *HERIOT*.) Other hospitals of a similar nature are Donaldson's, John Watson's, Canvin's, the Merchants' Maidens and the Trades' Maidens hospitals. In Sept. 1870 four hospitals, the Merchants' Maidens, George Watson's, Stewart's, and Gillespie's, all mainly under the management of the Edinburgh Merchant Company, were converted into day-schools under a provisional order. The schools that have taken the place of the first three of these institutions are intended to give a high-class education to boys and to girls, and their endowments have been partly employed in the foundation of bursaries and scholarships in connection with the schools. The Gillespie schools (for boys and girls) are primary, and part of the funds of this hospital are still utilized for the support of aged persons formerly maintained in it. The societies and institutions for the promotion of science and other branches of knowledge are exceedingly numerous. The principal are the Royal College of Physicians, incorporated in 1681; the Royal College of Surgeons; the Royal Society of Edinburgh; the Highland Society, instituted in 1785 for the promotion of agricultural improvements in Scotland; the Astronomical Society; the Society of Antiquaries, established by royal charter in 1780; the Medico-Chirurgical Society; the Royal Medical Society; the Royal Physical, the Botanical, and the Speculative Societies. There are two extensive public gardens primarily dedicated to scientific purposes—the Royal Botanic Garden, and the contiguous Arboretum. The principal libraries, except that of the University, have been mentioned above.

The industries of Edinburgh are important and varied. Ale-brewing, for which it has been famous for upwards of 200 years, is the principal, there being now about thirty breweries in the city. Letterpress printing, famous for its excellence, is another of the leading industries. Coach-building, type and iron founding, the manufacture of india-rubber and vulcanite, are carried on to a considerable extent; and also the construction of paper-making and other kinds of machinery. Glass painting and staining are prosecuted to some extent, and with much success. Edinburgh is the head-quarters of the publishing and book trade in Scotland; and as a literary mart it is the second town in the United Kingdom, being in this respect exceeded only by London. It has led the way in the introduction of literary ventures of a new class. Here were founded the Edinburgh Review, the first of the quarterlies; Blackwood's Magazine, which, by its life and vigour, revolutionized the character of the monthlies; and Chambers's Journal, the first of the cheap weeklies.

The origin of the city of Edinburgh and the derivation of the name are alike uncertain. The town is mentioned as early as the tenth century, but it did not acquire much importance until it was made the royal residence and capital of Scotland under the Stuarts in 1437. The first Parliament held at Edinburgh was in 1215, and after 1456 nearly all the Scottish Parliaments were held there. In 1296 the castle was taken by Edward I.; in 1318 it was recaptured by Randolph, Earl of Moray. In 1660 the city and castle surrendered to Cromwell, and in 1689 to the troops of William III. In 1786 it was the scene of the famous Porteous mob, of which a graphic account is given in Sir Walter Scott's *Heart of Midlothian*. In 1745 it opened its gates to the Pretender, Prince Charles Edward. Edinburgh is the native city of John Law, the projector of the Mississippi scheme; David Hume; Hugh Blair, the theologian and writer on belles-lettres; Dugald Stewart, Sir Walter Scott, and Lord Brougham.

Edinburgh is a terminus of the Caledonian Railway, and the chief station of the North British. The Waverley Station of the latter covers an area of 23 acres, of which half is under roof. Leith is the port of Edinburgh, and may be said to form a suburb. Portobello, which lies some distance to the east, on the Firth of Forth, is included within the municipality. The city returns four members to Parliament. Pop. in 1891, 263,646; in 1901, 316,479.

EDINBURGH, UNIVERSITY OF. This university was founded by the town-council of Edinburgh, under a charter granted by James VI. of Scotland in 1582, being opened as a very modest seat of learning the following year. The faculty of arts was the earliest; then followed that of divinity, the first professor being appointed in 1620. In 1621 an act of the Scottish Parliament ratified to the university all the privileges enjoyed by other universities in the kingdom, and the ratification was confirmed in the Treaty of Union between Scotland and England, and in the Act of Security. Some of the medical chairs were instituted in the seventeenth century, but it was only in the beginning of the eighteenth that the medical faculty was fully established. This faculty has latterly attracted many more students than any other. The constitution of the university was modified by the act of 1858 relating to the Scottish universities, by which the University Court and the body of Curators were created, and various regulations were made as to study and discipline. Down to 1858 the institution remained under the absolute control and patronage of the town-council. Further changes were introduced, as in the other Scottish universities, under the act passed in 1889, and these are embodied in the statements given below. Women may now graduate in arts, science, and medicine. The university is a corporation consisting of a chancellor, rector, principal, professors, registered graduates and alumni, and matriculated students. It is governed by the University Court, the Senatus Academicus, and the General Council. The Chancellor is elected for life by the General Council. He is the head of the University and the president of the General Council. The Rector is elected for three years by the whole body of matriculated students. He presides over the University Court. The Principal is the resident head of the college and president of the Senatus Academicus. The office is held for life. The University Court consists of the Rector, Principal, the Lord-provost of Edinburgh, and assessors appointed by the Chancellor, town-council of Edinburgh, the Rector, the General Council, and the Senatus respectively. The University Court has power to review all decisions of the Senatus Academicus, except as otherwise expressly regulated; to improve the arrangements of the University, after due communication with the Senatus, and after such proposed improvements have been submitted to the General Council; to fix the fees; to censure, suspend, or deprive of office any member of the Senatus, upon sufficient cause shown, and after such sentence of the Court has received the sanction of the Queen in council; and finally to inquire into and control the pecuniary affairs of the University. The Senatus Academicus or Senate consists of the Principal and the whole body of professors. It is intrusted with the superintendence and regulation of the teaching and discipline of the University. The General Council consists of the Chancellor, the members of the University Court, the professors, and all graduates. The General Council takes into consideration all questions affecting the well-being and prosperity of the University. The body of Curators consists of seven members, three of whom are nominated by the University Court, and four by the town-council.

There are six faculties in the university, viz.: arts, science, divinity, law, medicine, and music. In the faculty of arts there are fifteen professorships, twelve in the faculty of science, four in the faculty of divinity, seven in the faculty of law, and thirteen in the faculty of medicine. Some of the professors are appointed by the Crown, others are elected by the University Court and by special electors, and a considerable number by the Curators, who also elect the Principal. The number of matriculated students in 1898-99 was 2808.

As in the other Scottish universities the course in arts for the degree of M.A. extends over not less than three winter sessions of at least twenty teaching weeks each, or two winter sessions and three summer sessions. Before entering on his curriculum, each student must pass a preliminary examination in the following subjects: English, Latin or Greek, mathematics, and one of the following: Latin or Greek (if not already taken), French, German, Italian, dynamics. There is a higher and a lower standard in Greek, Latin, and mathematics, and the candidate must pass in the higher standard in one of these. He must then attend full courses of lectures in at least seven subjects, of which four must be: Latin or Greek; English, or a modern language or history; logic and metaphysics or moral philosophy; mathematics or natural philosophy. Candidates may obtain honours by submitting themselves before graduation to a severer examination in one or more departments.

Five years after the M.A. graduation the degrees of D.Phil. and D.Litt. may be obtained on examination, the former by graduates who have taken the M.A. degree with honours in mental philosophy, the latter by graduates who have taken the M.A. degree with honours in any group other than mathematics, natural philosophy, or mental philosophy, and who have attended at least two winter sessions or an equivalent period at Edinburgh University. A school-master's diploma of two grades is also granted, namely to those who have taken the M.A. degree with honours, and to those who have taken the ordinary M.A. degree, respectively. The university also conducts annually local examinations of schools similar to those of Oxford and Cambridge. It is one of the institutions in which candidates for the civil service of India may pass their period of probation.

Four medical degrees are conferred by the University of Edinburgh—Bachelor of Medicine (M.B.), Bachelor of Surgery (Ch.B.), Master of Surgery (Ch.M.), and Doctor of Medicine (M.D.). The candidate must pass a preliminary examination (unless holding such a degree as will exempt him), and before he can attain the degree of M.B. or Ch.B. he must have been engaged in medical study for at least five years. Neither of the degrees of M.B. or Ch.B. is conferred upon any person who does not at the same time obtain the other. Candidates for the degree of Doctor of Medicine must already have obtained the degree of Bachelor of Medicine and Bachelor of Surgery, and since obtaining these degrees must have practised for at least two years in general practice, or one year in the army or navy, or in attendance on an hospital, and must be at least twenty-four years of age. They must also pass an examination in clinical medicine and submit a written thesis. The regulations for the degree of Master of Surgery are similar.

The degrees in law conferred by Edinburgh University are Bachelor of Laws (LL.B.), Bachelor of Law (B.L.), and Doctor of Laws (LL.D.). Candidates for the degree of LL.B. must be graduates in arts of some university whose degree is recognised for that purpose by the University Court. They must also go through a prescribed university course in law, extending over a period of three academical years,

one of which must be passed in Edinburgh, and must successfully pass the necessary examinations. The degree of B.L. is intended for such law students as are not graduates in arts. One year of the law course of candidates for this degree must be passed at Edinburgh. The degree of LL.D. is purely honorary.

The degrees of Bachelor of Divinity (B.D.) and Doctor of Divinity (D.D.) are bestowed in the faculty of divinity. Candidates for the degree of B.D. must be graduates in arts of some British or specially recognised Colonial university; but if not graduates in arts of this university, they must have attended two classes in one or more of its faculties. The degree of D.D. is purely honorary. The theological curriculum of the university extends over three full and regular sessions or two full and three partial sessions.

The two degrees specially conferred under the head of science are Bachelor of Science (B.Sc.) and Doctor of Science (D.Sc.). The degree of B.Sc. may be taken in any one of four departments, viz., Agriculture, Engineering, Natural Science, or Public Health. That of D.Sc. is conferred in Natural Science, in Engineering, and in Public Health; and is conferred only on those who have already obtained that of B.Sc. Candidates for the degree of B.Sc. (except in Public Health) must have attended during three academical years at least seven courses of instruction embracing the subjects included in the science examinations which they propose to undergo, and four of these courses must have been taken at the University of Edinburgh. Candidates for the degree in Public Health must be graduates in medicine and must have attended at least two courses of instruction, scientific or professional, bearing on the subjects of the examination. Candidates for the degree of D.Sc. may submit themselves for examination after a lapse of five years from the date of their taking that of B.Sc.

The University Buildings comprise the College or University (old) building, a fine building, begun in 1789 and completed in 1828, a dome being subsequently added; the new medical class-rooms or University new buildings, built in 1878-88 at a cost of about £250,000, with the McEwan Hall presented as a gift; a separate music class-room possessing a fine organ; a botanical class-room in connection with the botanic gardens, &c. In connection with the university there are several museums, the Royal Botanic Garden, herbarium and museum, the natural history museum in the Museum of Science and Art, &c. The library of the University contains about 200,000 printed volumes, besides 7500 manuscripts, and numerous pictures and busts of professors and distinguished alumni. There is also a separate theological library containing about 10,000 volumes. There are various bursaries, scholarships, and fellowships in connection with the different faculties amounting to about £12,500. Their value varies from about £5 to about £170, and they are tenable for periods varying from one to four years. In respect of endowment Edinburgh University is not so well provided for as might be wished, but of late years much has been done to supply deficiencies. The University unites with that of St. Andrews in returning one member to Parliament. The constituency consists of the General Council.

EDINBURGH REVIEW. *THE*. This celebrated quarterly review was established in 1802, at a time when the periodical literature of the United Kingdom consisted of works conducted with inferior talent and occupying narrow grounds. Its success was immediate. All the great subjects of literature, science, philosophy, and politics were discussed in it with boldness, spirit, varied learning, acute reasoning, elegant criticism, a piquant satire, and profound and original

views. In politics it supported the Whigs. It was started by a number of young men in Edinburgh who were accustomed to meet occasionally to discuss questions connected with literature, politics, philosophy, &c. The principal of these were Brougham, Francis Jeffrey, the Rev. Sydney Smith, and F. Horner. It was edited for a few numbers by Sydney Smith; afterwards Jeffrey was the editor from 1808 to 1829, and was one of the most fruitful contributors throughout the long time during which he conducted it. Under his editorship the periodical reached the highest summit of its prosperity, when it had from 12,000 to 13,000 subscribers. Jeffrey was succeeded by Macvey Napier. Among the principal writers (besides those above-mentioned) are to be found the names of Playfair, Lealie, Sir Walter Scott, Sir W. Hamilton, Macintosh, Dugald Stewart, Dr. Thomas Brown, Carlyle, Macaulay, James Mill, Hallam, &c.

EDITION, the number of copies of a book printed at one impression. The first edition of any early printed work, especially one of the classics, is called the *editio princeps*.

EDMONTON, a town of England, in the county of Middlesex, on the New River, 7½ miles north of London. An extensive trade in timber and other merchandise is carried on here by means of the Lea River navigation. The 'Bell at Edmonton' has become famous by association with the adventures of John Gylpin. Charles Lamb died at Edmonton in 1834. Pop. in 1891, 25,381; in 1901, 46,899.

EDMUND I., King of England, an able and spirited prince, son of Edward the Elder, born about 921, succeeded his brother Athelstan in 940. He subdued Northumbria and the Five Danish Boroughs in 944, and in the following year conquered Cumbria, which he bestowed on Malcolm, king of Scotland, on condition of homage. He was stabbed at a banquet by Liofa, an outlaw, who entered among the guests, and provoked the king to a personal attack upon him. Edmund immediately expired of the wound, May 26, 946.

EDMUND II., surnamed *Ironside*, King of England, was a son of Ethelred II. by his first wife, and was born about 981. On the death of Ethelred in 1016 he was chosen king at London, whilst Canute was elected to the same dignity at Southampton. Edmund defeated the forces of the Danish ruler at Pen in Somerset, repulsed his attack at Sherston in Wiltshire, again defeated him at Brentford and at Otford, but was himself defeated at Assandun (now Ashington) in Essex, in consequence of the defection of Edric, duke of Mercia. A compromise was then effected, by which the midland and northern counties were assigned to Canute and the southern to Edmund. The latter died at London or Oxford on Nov. 30, 1016, murdered, it is said, at the instigation of the traitor Edric. This event made Canute master of the entire kingdom.

EDMUND, ST., King of the East Angles, born in Nuremberg in 841, began to reign in 855; died in 870. He was revered by his subjects for his justice and piety. Till within a short period of his death his kingdom enjoyed peace and prosperity, but in 870 he was attacked, defeated, and taken prisoner by the Danes. He refused the humiliating terms of peace that were offered to him by his conquerors, who on that account caused him to be bound to a tree, scourged, pierced with arrows, and then beheaded. St. Edmund was buried at Beodric's Worth, and a monastery and town gradually grew up round the place of his sepulture, which took from him the name of Bury St. Edmunds.

EDOM, a country mentioned in the Bible, lying to the south of Palestine. The Edomites are said in Genesis to be the descendants of Esau, who was also

called Edom, and who dwelt in Mount Seir, the mountain range now called *Jebel Shera*, stretching between the Dead Sea and the Gulf of Akabah. Their capital was Selah, which is most probably to be identified with Petra, a stronghold hewn out of the rocks in the range of mountains just mentioned. The Edomites were already securely established in their rocky fastnesses when the Israelites left Egypt under Moses, and on that occasion the Edomites refused to allow the descendants of Jacob to pass through their territory. At a later time the Edomites were attacked by Saul and subdued by David. Solomon, under whose reign they in vain attempted to deliver themselves from the Israelitish yoke, fitted out a commercial fleet in their ports. After the separation of the ten tribes they remained subject to the Kingdom of Judah until the reign of Jehoram, when they revolted and secured their independence for a time. They were again subdued about half a century later by Amaziah, who took Selah and gave it the name of *Joktheel* (that is, 'God-subdued'). Under Ahaz the Edomites again made themselves independent, and remained so till the time of the invasion of Judea by Nebuchadnezzar. After the return of the Jews from the captivity, the hereditary hostility between them and the Edomites manifested itself anew. During the revolt of the Maccabees the Edomites made common cause with the Syrians, but about 125 B.C. they were completely subdued and rendered tributary by John Hyrcanus. In New Testament times Edom was called *Idumæa*. Antipater, the governor of Idumæa, was made procurator of Judea by the Romans, B.C. 47. His son was Herod the Great, the king of Judea, in whose reign Christ was born.

EDRED, King of England, son of Edward the Elder, succeeded to the throne on the murder of his brother, Edmund I., in May, 946. He quelled a rebellion of the Northumbrian Danes, and compelled Malcolm, king of Scotland, to renew his homage for his English possessions. Although active and warlike he was extremely superstitious and subservient to the celebrated Dunstan, abbot of Glastonbury. Edred died after a reign of nine years, and left the crown to his nephew, Edwy.

EDRISI, ABU-ABDALLAH MOHAMMED, a famous Arabian geographer, a descendant of the ancient princely family of the Edrisites, born about 1100 A.D., at Tetuan, in the modern Morocco (according to others at Ceuta); died about 1180. He studied at the Moorish University of Cordova, after which he travelled through various countries bordering on the shores of the Mediterranean, and visited even France and England. He was then invited to the court of Roger II. of Sicily, where he resided under the patronage of Roger and his successors till his death. He constructed at the request of Roger a terrestrial globe of silver, on which the figure of the earth was shown with as much accuracy as the state of geographical knowledge at the time permitted. He accompanied this with a descriptive treatise bearing the title *Nuzhat Almushtak*, which was completed about 1150. An old manuscript of this work was discovered at Paris in 1829, and was published in a French translation by Jaubert, between 1836 and 1840.

EDUCATION. See SCHOOLS.

EDWARD THE ELDER, King of England, son of Alfred the Great, born about 870, succeeded his father in 901. Ethelwald, the son of his father's elder brother, claimed the crown; and an insurrection took place in his favour, but it ended with the death of Ethelwald in battle. The reign of Edward was further distinguished by successes over the Anglicized and foreign Danes. He fortified many inland towns, acquired dominion over Northumbria and East An-

gla, and subdued several of the Welsh tribes. He died in 925.

EDWARD, surnamed the *Martyr*, King of England, son of Edgar, succeeded his father, at the age of fifteen, in 975. His step-mother, Elfrida, wished to raise her own son, Ethelred, to the throne, but was opposed by Dunstan, through whose exertions Edward was peaceably crowned. His short reign was chiefly distinguished by the disputes between Dunstan and the foreign monks on one side, and the secular clergy on the other. The young king paid little attention to anything but the chase, which led to his unhappy death. Hunting one day in Dorsetshire he was separated from his attendants, and repaired to Corfe Castle, where Elfrida resided. After paying his respects to her he requested a glass of liquor, and as he was drinking on horseback one of Elfrida's servants gave him a deep stab behind. He immediately set spurs to his horse, but fainting from loss of blood, he was dragged in the stirrup until he died. The pity caused by his innocence and misfortune induced the people to regard him as a martyr. He had reigned four years.

EDWARD, surnamed the *Confessor*, younger son of Ethelred II. On the death of his maternal brother, Hardicanute the Dane, in 1041, he was called to the throne, and thus renewed the Saxon line. He was not the immediate heir, as his brother, Edmund Ironside, had left sons; but as he received the support of Godwin, earl of Kent, on condition of marrying his daughter, Editha, his claim was established. Edward was a weak and superstitious, but well-intentioned prince, who acquired the love of his subjects by his monkish sanctity and care in the administration of justice. He gained the title of saint and confessor by abstaining from nuptial connection with his queen. Having been educated in Normandy he introduced so many natives of that country to his court, that the French language and manners became prevalent in England to the great disgust of Earl Godwin and his sons. A rebellion took place, and Edward was forced to dismiss his foreign favourites. Perceiving that the youth and weakness of his son, Edgar Atheling, would not secure the succession against the power and ability of Harold, the son of Godwin, he turned his eyes upon his kinsman, William of Normandy, in whose favour it has been asserted that he executed a will. He died in 1066, leaving the point of the succession undetermined; and with him ended the Saxon line of kings. He caused a body of laws to be compiled from those of Ethelbert, Ina, and Alfred, to which the nation was long fondly attached. He was canonized by Alexander III. in 1166.

EDWARD, Prince of Wales, surnamed the *Black Prince*, one of the most chivalric and heroic characters of history, the eldest son of Edward III. and Philippa of Hainault. He was born in 1330, and at the age of fifteen accompanied his father in his invasion of France, and received from him the honour of knighthood. The victory of Crecy (August 26, 1346), which King Edward left principally to the exertions of the force under his son's command, to use that warlike king's language, 'showed that he merited his spurs.' It was on this occasion that he assumed the motto of *Ich dien* (I serve), used by all succeeding princes of Wales, and derived, it is said, from the crest of the King of Bohemia, slain in that battle, which tradition, however, later antiquaries seem disposed to discredit. In 1355 he commanded the army which invaded France from Gascony, and the next year fought the great battle of Poitiers (see EDWARD III.), and distinguished himself by the courtesy with which he treated his prisoner, King John. By the Peace of Bretigny his father had ob-

tained the provinces of Poitou, Saintonge, Périgord, Limousin, &c., which he annexed to Guienne and formed into a sovereignty for his son, under the title of the Principality of Aquitaine. There the prince took up his residence; and at his court Pedro the Cruel sought refuge, when driven from his throne by his natural brother, Henry of Trastamara. Edward undertook the re-establishment of this tyrant, which he accomplished, but lost his health in the enterprise. Disappointed by the perfidy of Pedro, of the stipulated reimbursements, the taxes he was obliged to levy on his new subjects rendered his government unpopular; and an appeal was made to the King of France, as his liege lord, who summoned him as his vassal to appear at Paris. 'I will come,' replied the angry prince, 'but it shall be at the head of 60,000 men.' His health, however, was too far declined to enable him to take the field, when the King of France invaded his dominions; and having suffered the mortification of seeing his generals defeated, he withdrew into England, and after lingering some time died (1376) in his forty-sixth year, leaving an only son, afterwards Richard II.

EDWARD, PRINCE CHARLES. See CHARLES EDWARD STUART.

EDWARD I. (of the Norman line), King of England, son of Henry III., was born at Winchester in 1239. The contests between his father and the barons called him early into active life, and he finally quelled all resistance to the royal authority by the decisive defeat of Leicester, at the battle of Evesham, in 1265. He then proceeded to Palestine, where he signalized his valour on many occasions, and inspired so much terror that an assassin was employed to despatch him, from whom he received a wound in the arm, which, as tradition reports, being supposed to be from a poisoned weapon, was sucked by his faithful consort, Eleanor of Castile. On assuming the government he acted with great vigour in the repression of the lawlessness of the nobles and the corruption in the administration of justice; but often evinced an arbitrary and grasping disposition. In 1274, and again in 1276, he summoned Llewellyn, prince of Wales, to do him homage, and upon his refusal, except on certain conditions, commenced the war which ended in the annexation of that principality to the English crown in 1283. Edward then spent some time abroad in mediating a peace between the crowns of France and Arragon, and on his return commenced his attempts to destroy the independence of Scotland. After his return from the Scottish expedition in 1296, which terminated in the capture of Bannockburn, he became involved in a quarrel with his clergy, who, supported by the pope, refused to submit to a tax which he had imposed on them. Edward forced their compliance by placing them out of the protection of the law. His frequent expedients to raise money at length produced great discontent among the nobles and people also, which obliged him to confirm the great charter and charter of forests, and also to give other securities in favour of public liberty. He then made a campaign in Flanders against France, which terminated with the recovery of Guienne and his second marriage with Margaret, the sister of King Philip. Meantime new commotions took place in Scotland under the guidance of the celebrated William Wallace. These transactions recalled Edward from Flanders, who hastened to the borders with an army of 100,000 men. The events of this interesting campaign cannot be detailed here; but the ignominious execution of the brave Wallace, in 1305, as a traitor, forms a blot in the character of Edward. Neither did it avail, since Robert Bruce was able, in 1306, to place himself at the head of a new confederacy. Highly

indignant at this determined spirit of resistance Edward vowed revenge against the whole Scottish nation, and, assembling another army, was on the point of passing the border when he was arrested by sickness and died at Burgh-upon-Sands, near Carlisle, July 7, 1307. Few princes have exhibited more vigour in action, or policy in council, than Edward I. His enterprises were directed to permanent advantages rather than to mere personal ambition and temporary splendour. Nor was he less intent upon the internal improvement of his kingdom than its external importance. The laws of the realm obtained so much additional order and precision during his reign that he has been called the *English Justinian*. He passed an act of mortmain, protected and encouraged commerce; and in his reign first originated the society of merchant adventurers. The manners of this able sovereign were courteous, and his person majestic, although the disproportionate length of his legs gave him the popular surname of *Longshanks*. He left a son and three daughters by his first wife, Eleanor, who died in 1290, and two sons by his second wife, Margaret of France.

EDWARD II., King of England, born at Caernarvon Castle in 1284, and the first English Prince of Wales, succeeded his father, Edward I., in 1307. He was of an agreeable figure and mild disposition, but indolent and fond of pleasure. After marching as far as Cumnock, in Ayrshire, with the army collected by his father, he returned, dismissed his troops, and abandoned himself entirely to amusement. His first step was to recall Piers Gaveston, a young Gascon, whom his father had banished, and whom he created Earl of Cornwall, and married to his niece. He then went over to France to espouse the Princess Isabella, to whom he had been contracted by his father, leaving Gaveston guardian of the realm. Soon after his return the barons associated against the favourite, whom they more than once obliged the king to send away. He was, however, as constantly recalled when the immediate danger was over, until an open rebellion took place; and, the person of Gaveston being captured, he was executed as a public enemy. In 1314 Edward assembled an immense army to check the progress of Robert Bruce, but was completely defeated at Bannockburn. After the death of Gaveston he selected a similar minion in the person of Hugh le Despenser, a young nobleman, upon whom he lavished favours of every kind, until the barons again rebelled, and the Parliament dooming Despenser and his father to exile, the king was obliged to confirm the sentence. Edward, however, on this occasion, in concert with the Despensers, contrived to raise troops and attack the barons, at the head of whom was his cousin the Earl of Lancaster, who, being taken prisoner, was executed at Pomfret. Several others also suffered, and the favourites were enriched with the spoils. Edward subsequently made another fruitless attempt against Scotland, which ended in the conclusion of a truce of thirteen years. In 1324 Queen Isabella went to France to settle some disputes in relation to Guienne, and while there, entered into a correspondence with several English fugitives, in whose hatred to the Despensers she participated. Among these was Roger Mortimer, a young baron of the Welsh marches, between whom and Isabella a criminal intercourse followed, in consequence of which the queen was still more determined upon the ruin of her weak and unhappy husband. Having formed an association with all the English malcontents, and being aided with a force by the Count of Hainault, she embarked for England in September, 1326, and landed in Suffolk. Her forces seized the Tower of London and other fortresses, captured and executed both the Despensers

without trial, and at length took the king prisoner, who had concealed himself in Wales, with a view of escaping to Ireland. The unfortunate Edward was confined in Kenilworth Castle, and in January, 1272, his deposition was unanimously voted in Parliament, on the ground of incapacity and misgovernment. A resignation of the crown was soon after extorted from him, and he was transferred to Berkeley Castle, where Mortimer despatched two ruffians, who, it is said, murdered him by thrusting a red-hot iron into his bowels, that no external marks of violence might remain, 21st of September, 1272, in the twentieth year of his reign and forty-third of his age.

EDWARD III., son of Edward II., by Isabella of France, was born in 1313. On his father's deposition in 1297, he was proclaimed king under council of regency, while his mother's paramour, Mortimer, really possessed the principal power in the state. The pride and oppression of Mortimer now became so intolerable, that a general confederacy was formed against him, at the head of which was the young king himself, who, now in his eighteenth year, could ill brook the ascendancy of his mother's minion. The result was the seizure of Mortimer (10th Oct. 1330), in the castle of Nottingham, where he lodged with the queen. He was tried and condemned by a Parliament at Westminster, and was executed 29th Nov. The queen was also confined to her manor at Risings, with a reduced allowance, and although treated with outward respect, never again during the remaining twenty-eight years of her life recovered any degree of authority. Edward now turned his attention to Scotland. Assisted by some principal English nobles, who enjoyed estates in that country which were withheld from them contrary to the terms of the late treaty, Edward Baliol, son of the John Baliol to whom the crown had been awarded by Edward I., raised a force, and defeating the Scots in a great battle, set aside David Bruce, then a minor, and was crowned at Scone in 1332. Baliol being driven away on the departure of his English auxiliaries, applied to Edward, who levied a well-appointed army, with which he defeated the regent, Douglas, at the famous battle of Halidon Hill, in July, 1333. This victory produced the restoration of Baliol, who was, however, again expelled, and again restored, until the ambition of Edward was called off by a still more splendid object. The crown of France, by the Salique law, having devolved to Philip de Valois, cousin-german to the deceased king, Charles the Fair, Edward was induced to claim it in right of his mother, that monarch's sister. There existed other claims that were superior; but these considerations weighed very little with a young, ambitious monarch, eager for conquest and glory. The first hostilities produced nothing of much moment. Edward, in order to obtain fresh supplies, made concessions to Parliament which he never intended to keep; and finding his territory of Guienne threatened, he sent over a force for its defence, and quickly followed himself, accompanied by his son Edward, the famous Black Prince, all his chief nobility, and 80,000 men. The memorable battle of Crécy followed, August 25, 1346, which was succeeded by the siege of Calais. In the meantime, David Bruce, having recovered the throne of Scotland, made an incursion, at the head of a large army, into England; but being met at Durham by a much inferior force, raised by Queen Philippa, and headed by Lord Percy, he was totally defeated and taken prisoner, with many of his principal nobles. Philippa went over to her husband at Calais, and, by her interference prevented the barbarous execution of Eustache de St. Pierre and five other citizens, whom Edward, on the capitulation of the place, had determined to execute, in revenge for his long detention in the siege.

In 1348 a truce was concluded with France. The year 1349 was distinguished by the institution of the order of the Garter, which, owing to the fame and chivalrous character of Edward and his eldest son, soon became one of the most illustrious orders of knighthood in Europe. Philip, king of France, dying in 1350, was succeeded by his son John, the commencement of whose reign abounded with intestine commotion, and in 1355 Edward again invaded France on the side of Calais, while the Black Prince at the same time led a large army from Gascony. Both these expeditions were attended with much plunder and devastation; and Edward, being recalled home by a Scottish inroad, soon repelled it, and retaliated by carrying fire and sword from Berwick to Edinburgh. During this time the Prince of Wales had penetrated from Guienne to the heart of France, where he was opposed by King John, at the head of an army nearly five times more numerous than that of the English. The famous battle of Poitiers ensued, in which the French monarch being taken prisoner, Edward held at the same time in captivity the Kings of France and Scotland, the most dangerous of his enemies. John was taken to England and treated with the greatest respect; and David was soon after liberated upon ransom. A truce had been made with France after the battle of Poitiers, at the expiration of which, in 1359, Edward once more passed over to Calais with a large army, and desolated the provinces of Picardy and Champagne, but at length consented to a peace, which was concluded in May, 1360. Besides the stipulation of a large ransom for King John, several provinces and districts in the south-west of France and neighbourhood of Calais were yielded to Edward, who in his turn resigned his title to the crown of France and duchy of Normandy. The successor of John, Charles V., invaded the provinces intrusted to Prince Edward, then in the last stage of declining health, and Edward had the mortification of witnessing the gradual loss of all his French possessions, except Bordeaux and Bayonne, and of all his conquests except Calais. In the decline of life he was in other respects unfortunate; becoming a widower, he fell into a species of dotage; and an artful mistress, named Alice Perrers, so abused her influence, that on a parliamentary remonstrance, he found it necessary to dismiss her. His administration also became unpopular; and he had the affliction of witnessing his heroic son, Edward, sink a victim to a lingering illness; which calamity he survived about a year, dying June 21, 1377, in the sixty-fifth year of his age, and fifty-first of his reign.

EDWARD IV., King of England, was born in 1441. His father, Richard, duke of York, was grandson of Edward, earl of Cambridge and duke of York, fourth son of Edward III., while the Lancaster branch descended from John of Gaunt, the third son. The York line had intermarried with the female descendants of Lionel, the second son, which gave it the preferable right to the crown. Edward, on the defeat and death of his father at the battle of Wakefield, assumed his title, and having entered London after his splendid victory over the Lancastrians at Mortimer's Cross, in Feb. 1461, was declared king by acclamation. Soon after his accession he had to fight for his crown against an army of 60,000 Lancastrians assembled in Yorkshire; and the field of Towton confirmed his title by a decisive victory. Although the high-spirited Margaret was enabled by the aid of Louis XI. of France again to take the field, the result of the battle of Hexham, in May, 1464, obliged her to return to Flanders, and leave her husband, the imbecile Henry, a prisoner in the hands of his enemies. Freed from warlike cares Edward indulged himself in the gallantries too common

to his age and station, and by a marriage with Elizabeth Woodville, widow of Sir John Grey of Groby, a Lancastrian, plunged himself into very serious difficulties, since at the same time he had despatched the Earl of Warwick to negotiate a marriage for him with Bona, sister to the Queen of France; so that he at once offended two royal houses and his powerful friend Warwick. Aided by France, Warwick, who had contracted his daughter to the Lancastrian Prince Edward, landed with Clarence and some other lords at Dartmouth; and quickly saw himself at the head of 60,000 men, with whom he marched to encounter Edward. They approached each other near Nottingham, where the king, by the treachery of the Marquis of Montague, in whom he placed great confidence, had nearly been betrayed into the hands of his enemies. He had just time to mount and ride to Lynn, where he instantly embarked, and reached a port in Holland, leaving Warwick in full possession of his kingdom, eleven days after he had set his foot in it. Henry's title was again recognized by parliament, and Warwick and Clarence were declared regents of the kingdom. Edward, who at first had been received rather coldly by his brother-in-law, the Duke of Burgundy, was at length secretly assisted by him with a small squadron of ships, and a force of about 2000 men, with which he safely reached Ravenspur, in Yorkshire. Here his forces quickly increased by partisans from all quarters, and he was soon enabled to march to London, where he obtained entrance as king, and the unfortunate Henry again became prisoner. Warwick advanced against him as far as Barnet, where, on the 4th of April, 1471, another great battle was fought, which ended in the death of Warwick, and a decisive victory on the part of Edward. On the same day Queen Margaret and her son landed at Weymouth, and marched into Gloucestershire, where she was met by the victorious Edward, who totally defeated her at Tewkesbury. The queen and her son Edward being taken prisoners and brought into the presence of the victor, Edward asked the latter how he dared to invade his dominions. On receiving a spirited answer he basely struck the captive prince on the face with his gauntlet—the signal for immediate massacre by the king's brothers and other nobles attendant. Margaret was thrown into the Tower, where Henry VI. soon after died, but whether by violence or by disease is uncertain. Edward now once more gave himself up to pleasure until seized with a desire to make French conquests. Baffled by the arts and intrigues of Louis XI. these attempts ended in nothing of importance. The latter part of his reign was disturbed by his jealousy of his brother Clarence, whom he latterly got condemned and put to death, it is said by drowning in a butt of Malmsey wine. Edward was preparing for another expedition against France, when he was taken off by sickness in April, 1483, in the forty-second year of his age, and twenty-third of his reign.

EDWARD V., King of England, the eldest son of Edward IV., was in his thirteenth year when he succeeded his father in 1483. He fell into the hands of his uncle the Duke of Gloucester, the regent, who caused the young king and his brother to be sent to the Tower, and, it is said, had them smothered by ruffians. Two bodies, answering their description, being found buried at the foot of the stairs of their apartment, in the reign of Charles II., were taken up by that king's order, and deposited in Westminster Abbey.

EDWARD VI., King of England, son of Henry VIII. by Jane Seymour, was born in 1537. At his father's death he was only ten years of age, and as he did not live to attain majority, the public acts of his reign are to be deemed those of his counsellors.

His education was intrusted to men of the first character for learning, among whom was Sir John Cheke. He was studious, somewhat retiring, devout, and showed a decided preference for the reformed doctrine, and antipathy to those of the Roman Church. He was often spoken of as 'the English Josiah'. After his father's death his maternal uncle, the duke of Somerset, became protector, but his administration raised up such powerful enemies that he was brought to the scaffold with the king's consent (1552). After his death Dudley, duke of Northumberland, became all-powerful, and through his influence Edward, in a declining state of health, was induced to set aside the succession of both his sisters, and to settle the crown upon Lady Jane Grey, claiming through his father's younger sister, the Duchesse of Suffolk. His decease, from a pulmonary complaint, soon after followed, July 6, 1553, in the sixteenth year of his age and seventh of his reign.

EDWARD, THOMAS, a Scottish naturalist, and the son of a private in the Fifeshire militia, was born at Gosport in 1814, and died 27th April, 1886. As the apprentice of a shoemaker he spent the early part of his life in Aberdeen, and in 1837 he married and settled in Banff. Here he struggled for forty years in a ceaseless effort to acquire a close knowledge of natural history, while at the same time he supported his wife and eleven children on wages that never exceeded fifteen shillings a week. Apart from his laborious work as a shoemaker he collected, described, and exhibited numerous specimens of natural history. A biography of Edward, written by Mr. Smiles, appeared in 1876 (*Life of a Scotch Naturalist*), and being thus prominently brought before the public, a pension of £50 a year was conferred upon him by the queen.

EDWARDS, BRYAN, the historian of the West Indies, was born at Westbury, in Wiltshire, in 1748. On the death of his father he was taken under the care of an uncle in Jamaica; who left him a large fortune. After a successful mercantile career he returned to England, and in 1796 took his seat for the borough of Grampond, which he represented until his death, in July, 1800. His most distinguished performance is his *History, Civil and Commercial, of the British Colonies in the West Indies*, 1798, two vols. 4to. A new edition of this work, published after his death, in 1801, three vols. 8vo, includes a history of St. Domingo. Mr. Edwards also published in 1796 the *Proceedings of the Governor and Assembly of Jamaica in regard to the Maroon Negroes*, 8vo.

EDWARDS, JONATHAN, the most celebrated of American metaphysicians and theologians, was born at East Windsor, Connecticut, October 5, 1703. His father, a minister of the gospel, instructed him in the dead languages. Jonathan entered Yale College, Newhaven, in September, 1716, and after taking his degree in 1720, remained nearly two years at Yale, preparing for the ministry. In September, 1722, he was elected a tutor in Yale College, and in the following year began to act in that capacity, but resigned his office in 1726, in order to become minister at Northampton (Massachusetts), where he was ordained February 15, 1727. His various sermons and disquisitions procured for him a wide reputation. His *Treatise on Religious Affections* was immediately republished in England and Scotland, and placed him among the first writers of his sect. After more than twenty-three years of zealous service in Northampton, a rupture occurred between him and his congregation owing to the candour with which he publicly reproved certain irregularities of some young persons connected with families in his church. An ecclesiastical council dismissed him in June, 1750; and in the following year he accepted a call to

as a missionary among the Indians at Stockbridge, in Massachusetts. Here he remained six years, exerting himself with an apostolical spirit, and at the same time prosecuting the deepest investigations in mental philosophy. Here he composed his famous works on the Freedom of the Will, and on Original Sin. The first is his masterpiece, and worthy of the powers of a Locke or Leibnitz. It was completed within the space of four months and a half. The date of its first appearance is the early part of 1754. In 1757 he was chosen president of the college at Princeton, New Jersey, and accepted this invitation, though not without reluctance, on account chiefly of his desire to accomplish two great literary enterprises which he had begun long before—a History of the Work of Redemption, and a View of the Harmony of the Old and New Testaments. In January, 1758, he repaired to Princeton, where he died March 22, 1758, in the fifty-fifth year of his age.

EDWIN, King of Northumbria, was the son of Ella, who seems to have ruled that kingdom from 559 to 589. Being an infant at his father's death the crown was seized by Ethelfrith of Bernicia. The young prince was sent for protection to the court of Redwald, king of East Anglia, by whose aid he was eventually put upon the throne (617). He married Ethelburga, daughter of Ethelbert of Kent, and by her influence and that of Paulinus, a Roman missionary, whom she had brought from her father's court, he was led to embrace Christianity, and make it the religion of his people. He was baptized in 627 at York, where he built the first church of wood. He did not long survive these events. The Mercians, under their king, Penda, revolted against the supremacy claimed by the Northumbrians; and the war which ensued was closed by a battle at Heathfield, or Hatfield, in Yorkshire, in which Edwin was defeated and slain (633).

EDWY, King of England, son of Edmund I., succeeded his uncle Edred in 955. Taking part with the secular clergy against the monks, he incurred the confirmed enmity of the latter. Having called Dunstan to account for his share in the administration in the preceding reign, the latter refused to attend the summons, and was in consequence banished. His party was, however, so strong that a rebellion was excited, and Edwy driven from the throne, to make way for his brother Edgar. That his marriage with Elgiva, his near relation, may have given a pretence for his deposition and excommunication is very probable, but there is reason to believe that the personal enmity of Dunstan and Odo, the leaders of the Papal party, was the real cause. His beautiful and unfortunate queen was seized by Odo's retainers, branded in the face to destroy her beauty, and transported to Ireland. In a short time she returned, cured of her cruel wounds, but was again captured, and was put to death by shameful torture (957). Edwy died in the following year, when he could not have been more than eighteen or nineteen years old.

EECLOO, a town, Belgium, province of East Flanders, 11 miles north-west from Ghent, near the Lieve, a canalized stream. It is a clean place, well built, and the seat of manufactures of woollens, cottons, hats, tobacco, chocolate, soap, starch, &c.; and has breweries, distilleries, vinegar works, salt-refineries, dyeworks, and oil-mills; and an active trade in grain, linen, cattle, and timber. Pop. (1899), 13,058.

EEL, a fish well known from its peculiar form and savoury flesh. Many varieties of eels are described by naturalists, some tenants of fresh-water streams, others inhabiting the sea. The latter acquire a vast size, and instances are said to have occurred of their having attacked and overpowered boys, and even men, while bathing. Gifted with prodigious

strength and agility, and capable of inflicting severe wounds with its powerful jaws, the sea-eel, or conger, must prove a most dangerous assailant, when encountered in its native element. Fresh-water eels, inhabiting running streams with gravelly bottoms, are said to be uniformly white upon the belly, and infinitely more delicate than those of muddy waters, which are always yellow, and possess a peculiar smell, and a very disagreeable flavour. In the choice of its food the eel is far from cleanly, feeding indiscriminately upon all kinds of small fish, and decayed animal matter; in consequence of which many persons refuse to eat them. In the seas of India there are large species caught, varied with the most beautiful colours, resembling serpents; and one in particular has so much the aspect of one of these reptiles as to bear the name of *snake-eel*. The flesh of eels is sapid and nourishing, but owing to its fatness, offensive to weak stomachs. Oil is procured from sea-eels, which is remarkably clear, and burns very brightly. A curious opinion formerly prevailed that a strip of eel-skin tied round the ankle would prevent the cramp, so dangerous to bathers. The voracity of the Mediterranean eel (*Muræna Helena*) led to the belief that it fed on human flesh; and more than one wealthy and unpopular Roman is said to have thrown his slaves into the fish-pond for the double purpose of punishing offenders and of improving the flavour of the fish. Vadius Pollio, in particular, is well known as having been guilty of this cruelty. *Muræna* was the term used to express the female eel, and *myrus* the male. The common eel belongs to the subgenus *Muræna* of Lacépède, and may be distinguished thus: dorsal fin commencing very much in the rear of the pectorals, and becoming continuous round the tip of the tail with the anal; upper jaw shorter; colour, olive-green above, silvery or yellowish beneath. Naturalists now place it in the genus *Anguilla*. In the conger-eel (genus *Conger*) the dorsal commences near the pectorals, or over them, and the superior jaw is always longest. The conger attains the length of 5 or 6 feet, and the thickness of a man's leg. A prejudice exists in America against the flesh, which in Europe is eaten in large quantities. Few animals are more tenacious of life than eels; they continue to move even when deprived of the head and skin, preserving the muscular irritability for many hours after death. Great quantities of river eels are consumed for food among the lower classes, the fish being caught in various ways. One way is by a kind of trident called an *eel-spear*. A fisherman wades to the shallows, and striking his spear in the mud in every direction around him, the eels, reposing on the bottom, are caught between the prongs. The reproductive organs of eels do not mature so long as they remain in fresh water, but when in salt water they quickly attain maturity. About September a seaward migration of adult eels takes place, and during the earlier months of the year the young eels or elvers ascend rivers in immense numbers. Male eels are not so readily obtained as female ones, being mostly restricted to the lower courses of rivers. After reproduction the adult fishes die. The respiration in the eel family proper (*Murænoidei*) is conducted through lateral openings at the gills, as in other fishes; but in the allied family *Symbranchii* the gill chamber opens by a single orifice under the throat. A great variety is observable in the form of the air-bladder of these fishes, which is wanting only in a few species; when present its cavity is divided by septa which contain vascular networks. Want of scales is usually mentioned as a characteristic of the family, but nevertheless inaccurately. Scales do exist; but they are very minute, and so imbedded in the skin as to be imperceptible in the recent animal, though sufficiently

evident in the dried skin. Some marvellous accounts are on record of the migrations of eels from one river to another over intervening portions of dry land. It is sufficiently well known that such journeys are taken by these fish, and mostly over very small portions of soil covered with damp grass, hence the stories of showers of eels and the like. The migrations of eels to and from the sea are probably undertaken to avoid the cold of fresh-water streams in winter. The mud of brackish estuaries is especially attractive to them, its temperature being higher than of the sea. Fresh-water eels spawn in spring, the conger in winter. Three (perhaps four) species of eels are natives of Great Britain. See illustration at ICHTHOLOGY.

EFFENDI, a corruption of the Greek word *authentēs*, which signifies lord or master in the modern dialect. It is a term of modern use in the Turkish language, and has been substituted for the Tartar word *chelebi* (noble), now applied to persons of inferior rank. Effendi is particularly applied to the civil, as *aga* is to the military officers of the sultan, and both are used in conversation commonly joined to the name of their office. Thus the sultan's first physician is called *Hakim effendi*, the priest in the seraglio *Iman effendi*, &c. The *Reis effendi*, or chancellor of the empire, is also minister of foreign affairs, and negotiates with the ambassadors and interpreters of foreign nations. Greek children are in the habit of calling their fathers *effendi*. The term is often used much in the same way as *Sir*, while the Greek *kurios* may be compared to our *Mr*.

EFFERVESCENCE, the rapid escape of a gas from a liquid, producing a turbulent motion in it, and causing it to boil up. It is produced by the actual formation of a gas in the liquid, as in fermentation, or by the liberation of a gas from a substance containing it, as in the decomposition of marble or carbonate of sodium by an acid, and by the solution of zinc or iron in an acid, or by subjecting a liquid saturated with the gas to a diminished pressure, as in the opening of a soda-water or champagne bottle.

EFFIGY, TO EXECUTE OR DEGRADE IN. The word effigy is derived from the Latin *effigies*, picture; and the phrase at the head of this article denotes the execution or degradation of a condemned criminal, when he cannot be personally apprehended, by subjecting his image to the formalities of an execution; for instance, affixing the image with a rope round the neck to the gallows (hanging in effigy). This practice is not altogether extinct in Prussia, and probably in other countries; but in England it has become merely a mode in which the populace expresses its feelings respecting an obnoxious personage; such as the English custom of parading and burning the effigy of Guy Fawkes on the 5th of November.

EFFLORESCENCE, a term applied to crystals, which, on exposure to the air, lose water of crystallization and crumble down into a powder. The most familiar instance is that presented by the glassy crystals of washing soda, which become white and pulverulent in the air. The same phenomenon is also presented by Glauber's salt, phosphate of sodium, borax, and other compounds. Another application of the word is to the fine white, feathery crystallization of sulphate and carbonate of sodium which appears on walls, or similar crystallizations on the surface of the earth, in decomposing rocks, &c. In all these cases the salt is in solution in water, the fluid is drawn by capillary attraction to the surface, evaporation takes place, and the salt crystallizes. Afterwards the crystals themselves lose water and effloresce in the other sense of the term. Efflorescence is in some respects the opposite of deliquescence, and the difference is shown by placing an efflorescent and

deliquescent body under a bell-jar. The former gives up its water, which the latter absorbs, becoming thereby fluid. But in reality the term is only relative to the circumstances in which the phenomenon usually takes place. Efflorescence occurs only when the tension of the vapour emitted by the salt at the temperature is greater than that of the vapour in the air at the time. And as this seems to be universally the case with carbonate and sulphate of sodium, efflorescence is looked upon as their natural condition. But if the effloresced salt be exposed to air in which the tension of the vapour is greater than that of the vapour it would give off at the temperature, then the salt will reabsorb water from the air.

EGBERT, considered the first king of all England, was of the royal family of Wessex. On the death of Alchmund, the former king, Brihtic, a powerful noble, succeeding in ousting Egbert, who had the best claim to the throne, and who was compelled to take refuge first in the court of Offa of Mercia, then in that of Charlemagne. On the death of Brihtic he succeeded him as King of Wessex, in 800. He reduced the other kingdoms, and rendered them dependent on him, in 827. He was much annoyed by the repeated inroads of the Danes. Egbert died in 838.

EGEDE, HANS, the apostle of Greenland, was born in 1686 at Harstad in Norway, and in 1707 became a preacher at Wogen. Having heard that Christianity had been once established in Greenland, but had become extinct in the country for want of teachers, he was filled with grief. After the most careful inquiry, he heard that the eastern coast of Greenland was inaccessible on account of the floating ice, and that the southern was inhabited by savages. He resolved to visit the country, and to preach the gospel to the inhabitants. Having collected some money to aid him in his purpose, he resigned his charge, received from the Danish government, after the conclusion of peace with Sweden, the title of royal missionary to Greenland, with a small pension and three ships, one to remain with him, another to bring back the news of his arrival, and a third to engage in the whale-fishery. On May 21, 1721, Egede embarked, with forty-six persons under his command. The whaling vessel was wrecked; the other two reached Greenland, where Egede landed on June 4. The conversion of the Greenlanders was now undertaken, but offered great difficulties; and the whole colony, tired of struggling against misery and wretchedness of every description, were eager to return to Denmark. Egede resolved to adopt that course; but the firmness of his wife prevailed upon them all to remain, and the arrival of two ships from Denmark set them at their ease. Egede took up his residence, with his two sons, among the natives, in order to learn their language, and so be able to carry out his project of conversion. He carefully noted down every word of which he discovered the meaning; he often performed long journeys, at the peril of his life, to visit the remotest Greenlanders, for the purpose of gaining their confidence, in which he succeeded by a thousand acts of kindness. After spending fifteen years in Greenland, amid innumerable discouragements, he returned in 1736 to Copenhagen, to make new exertions for the support of Christianity in that country. The government appointed him director of the Greenland missions, and established his son Paul in the office of missionary there. When age rendered him incapable of the exercise of his duties, he retired to the island of Falster, where he died, 1758. His writings are in Danish, and relate to the natural history of Greenland, and his sufferings and adventures there. His son, PAUL EGEDER, born 1708, was his assistant from the time he was twelve years old. Notwithstanding

a strong inclination for the naval service, he submitted to the wishes of his father, studied divinity, joined the mission in Greenland in 1784, and remained there till 1740. He then returned to Copenhagen, and afterwards was appointed Bishop of Greenland. He died at Copenhagen in 1789. We have from him an Account of Greenland, extracted from a Journal kept from 1721 to 1788; Dictionarium Groenlandicum; Grammatica Groenlandica; and translations of the Gospels, the Imitation of Christ, &c., in the Greenland tongue.

EGER, a town in the north-west of Bohemia, on a rocky eminence above the Eger, 91 miles west of Prague. It was once an important fortress, but its fortifications were demolished early in the nineteenth century, and its old castle, finely situated on a height, and once the residence of kings and emperors, is completely dismantled and crumbling into ruins. Among the existing edifices are a beautiful old church, restored in 1892, a town-house, a theatre, central school, and a railway-station in which six lines meet. There are various industries, including machinery, wool, cotton, and leather manufactures, and a flourishing trade. The celebrated Wallenstein was assassinated here (1634). A fine avenue, 3 miles long, leads to the watering-place of Frangensbad. Pop. (1890), 18,658.

EGER, a river which rises in Bavaria, in the Fichtelgebirge, 12 miles north-west of the above town, flows first south-east, then takes a north-easterly direction, and falls into the Elbe near Leitmeritz, in Bohemia, after a course of about 190 miles.

EGERIA, a nymph who received divine honours among the Romans. Numa is said to have had secret conversations with her, and to have received from her the laws which he gave to the Romans. Some say Egeria was the wife of Numa.

EGERTON, FRANCIS. See BRIDGEWATER (DUKE OF).

EGG. Birds, reptiles, fishes, insects, and worms bring forth eggs, as do also the duckmole and the echidna. The term egg is sometimes used as synonymous with ovum, and using it in this sense we may say that almost all animals reproduce their kind by means of eggs, the egg in its simplest form being merely a cell. But in popular use the term egg refers to the more conspicuous bodies composed of the ovum and various additions and coverings. The eggs of fishes form their roe or spawn. Eggs contain the germ of the young animal, and, in this respect, resemble the seeds of plants. Seeds require heat and moisture to develop them; and a great part of their substance serves for the nourishment of the germ. So it is with eggs, which have in addition, the necessary moisture in themselves, and, therefore, only need external heat for their development. The bird's egg consists (1) of the shell. Immediately beneath this hard, porous covering lies firmly inclosed (2) the external membrane, which is also a little porous. Next comes (3) the white of the egg, or *albumen*, and, lastly (4), the yolk, or *vitellus*. In the yolk is seen a small, lens-shaped speck, in which is found a little oval sac, of a grayish colour. This is the place where the young animal originates. The form of the eggs of birds is generally more or less of an oblong spheroid, but some are almost spherical, and others have one end much more pointed than the other. There is a great variety of shades in the colours of birds' eggs, though they are confined chiefly to white, blue, and green. The spots, blotches, or streaks with which many are marked, run in countless degrees and shades, from dark-brown and red into gray, ash-coloured, &c. With regard to the size of eggs there is a very wide range, from that of the humming-bird to that of the ostrich, and still more to that of the extinct *spycornis*, the shell of which could hold

two gallons, and was about 3 feet in circumference. The eggs of birds, especially of poultry, are a pleasant and nutritive food. Among reptiles, turtles produce eggs which are good for eating. The roe of fishes is also eaten, and caviare is composed wholly of the eggs of fish. The white of hens' eggs is used for various purposes, such as for clarifying certain liquors. It also furnishes a sort of varnish, and mixed with powdered, fresh-burned lime and other substances, according to circumstances, it forms a very strong cement. To preserve eggs for any length of time, they must be kept from the air. They may be rubbed over with butter, lard, gum-water, &c., set on the small end upon a perforated board, or, which is still better, they are placed in layers, upon the small end, in very dry ashes, in dry salt, &c., inclosed in tubs and boxes, and put in a dry place, protected from severe cold in winter, but at the same time not too warm. Eggs are of considerable importance in a commercial point of view. In England vast quantities are brought from the country to the large towns, but not in sufficient numbers for the demand, and they are largely imported from the Continent, chiefly from France, Germany, Russia, Belgium, and Denmark, also from Canada, U. States, Egypt, Morocco, &c. The value of eggs imported into the United Kingdom in 1899 was £5,044,102. See also OVUM, INCUBATION, REPRODUCTION, &c.

EGG, an island. See EGG.

EGGA, a town of West Africa, in the British territory of Northern Nigeria, on the right bank of the Niger. It consists of clay houses of a conical form, often closely packed together in narrow lanes. The inhabitants, numbering from 12,000 to 15,000, are partly Mohammedans, dress neatly, and manufacture cloth, generally dyed blue, pottery, leather, iron goods, wooden articles, &c.

EGG-PLANT (*Solanum melongena*), a plant of the natural order Solanaceæ, reaching the height of 2 feet, and more or less covered with pubescence; the flowers are large, white or purplish; the fruit is of an egg-shape, smooth, and shining, and of a white, yellow, or violet colour. It is a native of the East Indies, and is cultivated in greenhouses in Britain, being also well known in the United States and elsewhere. The fruit is used as an article of food when cooked, which is done in various ways. *S. Sodomeum*, Sodom egg-plant, or apple of Sodom, is a native of the north of Africa and south of Europe; the fruit is white, and of the size of a walnut. *S. sanctum* is the Palestine egg-plant, and there are several other species.

EGIL SKALLAGRIM, an Icelandic bard or poet of the tenth century, who distinguished himself by his warlike exploits and adventures in Norway, Denmark, and England. Having killed in combat the son of Erik Blóðox, king of Norway, he was doomed to death on being subsequently taken prisoner by that prince in Northumbria, but was allowed to redeem his life by giving a specimen of his powers as an improvisatore. He immediately composed and recited a poem in praise of Erik, known as Egil's Ransom, which procured him his life and liberty. This piece (as well as two others attributed to him) is still extant, and Dr. Percy translated it into English, and printed it in his Northern Antiquities. Egil is said to have been born about 901, and to have died about 980, but little dependence can be placed on many of the statements regarding him in the Egil's Saga.

EGINA. See **EGINA**.

EGINHARD (or **EHARD**), early German writer, born in East Franconia about 770, studied at Aix-la-Chapelle under Alcuin and the other learned men whom the Emperor Charlemagne had drawn

to his capital. His talents and learning gained him the love and confidence of Charlemagne, who made him his private secretary, chaplain, and general superintendent of the imperial buildings. According to a well-known legend, Emma, the emperor's daughter, fell in love with the handsome young scholar, and once admitted him to a nightly interview in her own room; the snow fell during the night, and Emma carried her lover across a courtyard on her shoulders, to save him from detection; the emperor, who had risen early, saw them from the window, and instead of punishing, united them in marriage. His wife's name was Emma or Imma, but she was a sister of the bishop of Worms. On the death of the emperor, Eginhard had much influence with his successors. He was abbot of several great houses, and established a monastery at Seligenstadt, on the Main, where he died in 840. Eginhard is the oldest German historian; and we have from him a full and well-written history of the life of Charlemagne (*Vita Caroli Magni*), many editions of which have been published. *Annales Einhardi*, or *Annals of the Franks*, from 741 to 829, are also doubtfully attributed to him. A number of his letters, which are valuable contributions to the history of his age, are still extant. Among the best modern editions of his works is that of Teulet (Paris, 1840-43, two vols. 8vo, with French translation).

EGLANTINE, one of the names of the sweet-brier (*Rosa rubiginosa*); but there is a good deal of confusion in its application, and it is often given indiscriminately to other species of rose.

EGMONT, LAMORAL, COUNT, was born in 1522, of an illustrious family of Holland. He entered the military service, and gained a high reputation under Charles V., whom he accompanied to Algiers in 1541, and in other expeditions. He distinguished himself as general of cavalry, under Philip II., in the battles of St. Quentin (1557) and Gravelines (1558), and was made stadholder of the provinces of Flanders and Artois. Philip having gone to Spain, Egmont gave support to the discontent in the Low Countries; he endeavoured, however, to adjust the difficulties between the Duchess of Parma, who governed the provinces, and the nobles confederated against her. He even swore, in the presence of this princess, to support the Roman Catholic faith, to punish the sacrilegious, and to extirpate heretics. Still, his connection with the Prince of Orange and his most distinguished adherents made him an object of suspicion to the Spanish court, and Egmont, with the noble Philip of Montmorency, Count Horn, became the victims of hate and fanaticism. The Duke of Alba, who was sent by Philip II. to the Netherlands in 1567 to reduce the insurgents, had Egmont and Horn treacherously seized, and caused them both to be executed at Brussels, June 5, 1568. Egmont died with heroic firmness. He had before written to Philip II., that 'he had never joined in any undertaking against the Catholic religion, nor violated his duties as a loyal subject'. But the Prince of Orange having taken the field as the champion of his country's wrongs, an example was thought necessary to strike terror into the insurgents. Philip II. expressed himself thus on the subject: 'He had caused those two heads to fall, because a pair of such salmon heads was worth more than many thousand frogs'. There can be little doubt that the Spanish king unnecessarily dreaded the influence of the gallant soldier, but incapable politician. When the troubles in the Netherlands broke out, Egmont, moved by generous sympathy for his injured countrymen, rather than by any fixed principle of action, was found side by side with the Prince of Orange, in the van of the malcontents. But in opposition to the popular movement

came his strong feeling of loyalty to Spain, and his still stronger devotion to the Roman Catholic faith. Thus, the opposite forces by which he was impelled neutralized each other, and, ever acting from impulse, he did not calculate the consequences of his conduct. When these consequences came he was not prepared to meet them. See Motley's *Rise of the Dutch Republic*.—A well-known drama of Goethe, called *Egmont*, is founded on the above catastrophe.

EGREMONT, a town of England, in Cumberland, in the pleasant valley of the Ehen, about 5 miles south-east of Whitehaven, and barely 3 miles from the Irish Sea. It consists mainly of a single long street, has a Norman church rebuilt in modern times, various other places of worship, a town-hall, mechanics' institute, &c. Here are the ruins of the ancient castle of Egremont, connected with which is the legend celebrated by Wordsworth in his poem, *The Horn of Egremont Castle*. The town gives name to a parl. division of the county. Iron ore and limestone are worked. Pop. (1901), 5761.—There is another Egremont in Cheshire, on the Mersey, opposite Liverpool, of which, or of Birkenhead, it may be considered a suburban district.

EGRET, a name given to those species of white herons which have the feathers of the lower part of the back elongated and their webs dissiminated, reaching to the tail or beyond it at certain seasons of the year. Their forms are more graceful than those of the common herons. The American egret (*Ardea egretta*) has the plumage white, or partly of a creamy colour. The bird is found breeding from Florida to New York, and along the shores of the Mexican Gulf to Texas. Its food consists of the smaller quadrupeds, small fishes, frogs, lizards, snakes, and insects. The long silky filaments of the back are hardly to be seen, except about the love season, which varies from early spring to mid-summer according to climate; both sexes possess this train, and many are shot to obtain those feathers for ornamental purposes. The European egret (*A. alba*) is about 40 inches long, of a pure white plumage; the bill is black or dark-brown, yellow at the base and about the nostrils, and the legs are almost black. It is common in southern Europe, but comparatively rare in the northern and central parts. The little egret (*A. garzetta*) is about 22 inches long from bill to end of tail, the plumage is white; from the hinder part of the head spring two narrow feathers 4 inches long. This species is confined to the eastern hemisphere, being most abundant in southern Europe and northern Africa; it occasionally wanders as far as England.

EGYPT (in Greek, *Aiguptos*; in Hebrew, *Misr* or *Misraim*; in the language of the country in hieroglyphics, *Kemi*—which signifies the *black land*; and by the Arabs of the present day called *Misr*), a country in the north-eastern part of Africa, forming a semi-independent portion of the Turkish dominions. It is bounded on the N. by the Mediterranean Sea, on the E. by Arabia Petrea and the Red Sea, on the S. by Nubia, and on the W. by the Libyan Desert; cultivated area, 12,976 sq. miles; total area, 394,000. Nubia is now attached to Egypt, and the Khedive or sovereign of Egypt has joint authority with Britain over the Egyptian Soudan, which includes the Bahr-el-Ghazal valley, Kordofan, and Darfur. Egypt is connected with Asia by the Isthmus of Suez, across which runs the great canal, about 100 miles long. The inhabited portion of Egypt is mainly confined to the valley and Delta of the Nile, which where widest does not exceed 120 miles, while in many parts the valley is only from 10 to 15 miles wide, at the southern frontier only 2 miles. West of the Nile are several oases. Two ranges of lofty

mountains, the Arabian Hills on the east, and the Libyan on the west, inclose this valley. The Nile enters Egypt proper at Assouan (Syene), just below the First Cataract, and from this point flows northward until it reaches lat. 30° 15', where it divides into two main streams, the one entering the sea by the Rosetta mouth on the west, the other by the Damietta mouth on the east. These two streams carry the bulk of the Nile water to the Mediterranean, and inclose a large portion of the territory known as the Delta, from its resemblance to the Greek letter Δ, and which owes its existence to the deposits of alluvial matter brought down by the stream. The Delta is traversed by a net-work of primary and secondary channels, and is also intersected by numerous canals. Seven principal channels or mouths were usually recognized in ancient times, the names of which, going from east to west, were the Pelusiac mouth, the Tanitic, the Mendesian, the Phatnitic (Damietta), the Sebennytic, the Bolbitic (Rosetta), and the Canopic. The Nile has a current running seaward at the rate of 2½ or 3 miles an hour, and the stream is always deep enough for navigation. The water becomes a reddish-brown during the annual overflow: it is esteemed highly salubrious. Near the sea are Lake Menzaleh Mariut (Mareotis), and other extensive but shallow lagoons. The openings or lateral valleys of the hills confining the valley of the Nile are comparatively few, or, being little frequented, are not well known. Those on the east side with which we are best acquainted are the Valley of the Wanderings (of the children of Israel), leading from the neighbourhood of Cairo to the head of the Gulf of Suez, and that through which passes the road from Koptos to Kosseir on the Red Sea. A short distance west of the Nile and above the Delta is the fertile valley of Fayoum (which see), in the north-west and lowest part of which is the lake Birket-Karun or Birket-el-Kerûn, fed by a canal or branch from the Nile. The level of the lake is now 130 feet below that of the Mediterranean. This lake, formerly known as Lake Mœris, anciently covered a far larger area, and by means of sluices and other works was utilized for irrigation purposes. The deserts on the west bank of the Nile generally present to view uniform plains of gravel or of fine drifting sand; on the east the scene is varied by rocks and mountains, but the aridity is extreme, and the heat, reflected from surrounding cliffs, is often insupportable.

Oases.—The oases already mentioned extend in a narrow line along the hollow region of the Libyan desert, parallel to the general direction of the valley of the Nile, and above 80 miles west of it. The Great Oasis, or El Wah (that is, the oasis) el Khârgah, lies immediately west of the Thebaid, and has a length of 100 miles. About 50 miles west of the northern extremity of this oasis lies the Wah el Dakhliah, 24 miles long and 10 miles broad. West by south from the Fayoum the date groves of the Little Oasis, or Wah el Baharieh, display their unusual verdure. In this fertile spot artesian wells are numerous, and some of ancient construction have been discovered which have a depth exceeding 400 feet. On the road between this oasis and that of El Dakhliah, inclining to the west, occurs halfway the Wah el Farâfrah, of small extent. West of the Fayoum, and about 200 miles from the Nile, lies the oasis of Siwah, where the foundations of the once-celebrated temple of Jupiter Ammon may still be traced. The inhabitants of this secluded spot, though tributary to Egypt, are in language and manners wholly Libyan. The region of the oases terminates towards the north in the desert of the Natron Lakes.

Rise and Fall of Nile, Irrigation.—The most re-

markable phenomenon connected with the river is its annual regular increase, arising from the periodical rains which fall within the equatorial regions and the Abyssinian mountains. As rain rarely falls in Egypt, the prosperity of the country entirely depends upon this overflowing of the river. On the subsiding of the water the land is found to be covered with a brown alimy deposit, which so enriches the soil that with a sufficiency of water it produces two crops a year, while beyond the limits of the inundation and irrigation there is no cultivation whatsoever. The Nile begins to rise in June, and continues to increase until about the end of September, overflowing the low lands along its course, the water being conveyed to the fields by artificial courses where natural channels fail. After remaining stationary for a short time, the river rises again still further, but subsequently begins to subside, showing a markedly lower level in January, February, and March, and reaching its lowest in April, May, and early June. The overflow water is now to a great extent managed artificially by means of an extensive system of reservoirs and canals, so that after the river subsides it may be used as required. A certain proportion of the fields, after receiving the overflow and being sown, can ripen the crop without further moisture; but many others always require artificial irrigation. Steam-pumps are now largely used in northern Egypt. Lately the government has tried to make the farmers less and less directly dependent on the inundation, and the great *barrage* of the Nile below Cairo, 'the largest weir in the world', is one means to this end, the great dam or barrage at Assouan being another.

The native methods of raising water for irrigation are chiefly by the *sakieh*, or water-wheel, and the *shadouf*. The first consists of a horizontal wheel turned by one or two oxen, which sets in motion a vertical wheel, around which are hung a number of earthen jars, this wheel being sunk into a reservoir connected with the river. The jars thus scoop up the water and bring it to a trough on a level with the top. Into this trough each jar empties itself in succession, and the water is conducted by an inclined channel into the cultivated ground adjoining, which may have been previously divided into compartments of 1 or 2 yards square, by raising the mould into walls or ridges of 5 or 6 inches in height. Into these compartments the cultivator forms an entrance for the water, by depressing a little space in the ridge or wall with the sole of his foot; and this overlooking of the channels of irrigation, and adjustment of the openings from one compartment to the other with the foot, is continued till the cultivator is assured by the growth of the plants that each compartment is daily and duly supplied with its proper quantity of water. To this peculiarity in the cultivation of the soil of Egypt, whether for corn or other production, allusion is made in Deut. xi. 10. The second means of raising water, namely, the *shadouf*, consists of a leathern bucket slung at one end of a pole, which has a weight at the other and sways up and down on a vertical support, a contrivance by which the cultivator is enabled to scoop up the water considerably below his feet, and raise it with comparative ease to the mouth of a channel on a level with his breast. The latter mode of raising water is of great antiquity, and is depicted on the walls of the ancient tombs of Egypt, and also in the sculptures from Nineveh. A sufficient rise of the river (the rise varies at different points) is essential to secure the prosperity of the country; and as the water subsides, the chaplet of buckets on the *sakieh* is lengthened, or several *shadoufs*, rising one above the other on

the river bank, are required. Should the Nile rise above the requisite height it may do great damage; while if it should not attain the ordinary height, there is a deficiency of crops; but so regular are the operations of nature that, with rare exceptions, the inundations are nearly uniform. What is called the winter crop, consisting of wheat, barley, &c., is sown as soon as the river subsides sufficiently, and the harvest takes place in March and April. The summer crops, including rice, cotton, &c., occupy the period from April to August, or even onwards till November or December. Maize forms an important crop in the autumn season.

Climate.—The atmosphere in Egypt is extremely clear and dry, the temperature regular and hot, though the heat is tempered during the daytime for seven or eight months of the year by the strong wind which blows from the north, and which enables sailing vessels to ascend the river against the stream. The winter months are the most delightful part of the year, the air being cool and balmy, and the ground covered with verdure; later, the ground becomes parched and dry, and in spring the suffocating khamseen, or simoom, frequently blows into the valley from the desert plains on each side of it, raising clouds of fine sand, and causing great annoyance, until the rising of the river again comes to bless the land. It rains but rarely, except near the sea-shore. At Memphis the rain falls perhaps three or four times in the course of a year, and in Upper Egypt only once or twice, if at all; showers of hail sometimes reach the borders of Egypt, but the formation of ice is very uncommon. Earthquakes are occasionally felt, and thunder and lightning are neither frequent nor violent. Egypt is not remarkably healthy, especially in the Delta, ophthalmia, diarrhoea, dysentery, and boils being somewhat prevalent. But many invalids now winter in Egypt, especially in the neighbourhood of Cairo, or higher up the river, where the air is dry and pure.

Geology and Mineralogy.—The hilly region which separates Egypt from Nubia is composed of granitic rocks, which terminate at Assouan (Syene), but extend up the shore of the Red Sea to near the Gulf of Suez. The Arabian and Libyan hills are both composed of cretaceous strata, the predominant rock being sandstone. This sandstone extends from Assouan to Erané, about 85 miles, where it is covered by a limestone of the upper chalk series. From thence for 180 miles the valley is bounded with a tertiary nummulite limestones. Over a great extent of Egypt the rocks are covered with moving sands, and in the lands bordering on the Nile by the alluvium deposited during the inundations, which consists of an argillaceous earth or loam, more or less mixed with sand. This sedimentary deposit has no traces of stratification. The minerals used in the ancient buildings, sculpture, vases, &c., were found in the rock formations of the country. These include granite, syenite, basalt, sandstone, alabaster, limestone, breccia, and porphyry. Among other valuable products were emeralds, gold from the mines in Upper Egypt, iron from the desert plains of Nubia, and natron from the lakes in the Oasis of Ammon, hence called sal-ammoniac. Bitumen, salt, and sulphur are also among the minerals of Egypt.

Botany.—It would appear that, anciently as now, Egypt did not produce timber; the chief trees, besides the date-palm and tamarisk, being the sycamore, Christ's thorn, carob, and two species of acacia. Many trees have been planted in recent times, especially about Cairo, such as the lebbek (*Albizzia Lebbek*) and the eucalyptus. The papyrus plant, once so important, is now to be found only in one or two spots. Of it was manufactured a paper,

which was supplied to all the ancient world. Boats, baskets, cords, and shoes were also made of it. Besides this and the lotus or water-lily of the Nile, Egypt has always been celebrated for its production of wheat, barley, a great variety of the bean class, leeks, garlic, onions, flax, and for plants of the cucumber tribe, as we learn from the sculptures and from several passages in Holy Writ, and they are still abundant as ever. To the products of ancient times have been added the sugar-cane, cotton plant, indigo, and tobacco. Wine was abundantly produced in ancient Egypt, and the sculptures bear ample testimony to the extent to which the ancient Egyptians indulged in wine and beer or other intoxicating beverages. The vine is still much cultivated, but little or no wine is made, as it can easily be imported.

Zoology.—Egyptian oxen were celebrated in the ancient world; buffaloes are now common. The camel was introduced at an early period; horses and asses have long abounded. The wild animals include the hyena, jackal, fox, lynx, genet, ichneumon, jerboa, wild goat, gazelle and one or two other antelopes, hare, &c.; the hippopotamus was known, and the crocodile formerly reached the Delta, but is now seldom seen below Assouan. Water-fowl are plentiful, and were anciently prepared and salted like the fish of the Nile, as we learn from the sculptures, and must have been a great source of wealth; there are numerous vultures, hawks, &c. The sacred ibis is still a regular visitor during the inundation, and the pelican is found in the northern lagoons. The asp and other reptiles are common. The Nile abounds in fish. Scorpions and venomous spiders occur. Among the countless insects are the sacred beetle, the locust, and mosquito. Many of the animals, birds, and reptiles were held sacred by the people; whoever killed a sacred animal, an ibis or a hawk, was put to death. If a cat died a natural death every person in the house shaved his eyebrows; if a dog died, the whole body and the head were shaved. The cats were buried at Bubastis, the dogs in the vaults of their own cities, field-mice and hawks at Buto, the ibis at Hermopolis, and other animals where they were found lying. Of all animals the sacred calf Apis was the most revered. His chief temple was at Memphis. The females, being sacred to Isis, were thrown into the Nile, which was considered sacred, and the males were buried at Sakkara, where their tombs were discovered by M. Mariette.

Industry and Commerce.—The branch of industry for which Egypt is peculiarly adapted by nature is agriculture, and large quantities of cereals, cotton, and other agricultural produce are raised; yet, generally speaking, agriculture is still in a very low state, the necessary consequence of the wretched condition and extreme poverty of those engaged in it. The Egyptians still adhere to their ancient custom of uniting the followers of each business or profession into a guild, governed by their sheikh, who acts, if need be, as their representative. These guilds are exceedingly numerous, as might be expected among a people whose social organization dates from a remote antiquity. Few occupations can claim especial mention on the score of importance or singularity. Among these few we must place the business of the egg-hatching establishments. A very steady heat (about 104°) is required for the success of this process, yet the keeper of the ovens never uses a thermometer, but is guided wholly by experience and practised sensation. The business of tanning also is one in which the Egyptians succeed perfectly, by a process peculiar to themselves. They make excellent Morocco leather, which is goatskin dressed and dyed in

a particular manner. The pottery of Egypt also deserves a word of praise, chiefly for the merit of the *bardaks* or water-jars. Coarse cotton cloths, and cloths of mixed cotton and wool, are largely made in the country; silk is cultivated to some extent; and the cultivation of the sugar-cane received a great impulse from the viceroy Ismail, who erected a number of mills at great expense. The commerce of Egypt is large. The total value of the exports is about £12,800,000 per annum; imports, £9,780,000. In 1899 the exports from Egypt to Great Britain amounted to £10,914,354 (£7,743,611 being cotton); British imports into Egypt to £5,224,394. Goods carried by the Suez Canal do not form part of the commerce of the country, and the transit trade proper is of little importance. There are now over 1200 miles of railway in operation in the country. A railway runs from Alexandria to Assuan, and another by way of continuation from Wady Halfa, below the Second Cataract, to Khartoum.

Inhabitants.—Of the inhabitants of Egypt those of the peasant class, or Fellahs, as they are called, are undoubtedly indigenous, and may be regarded as descendants of the ancient Egyptians. They have mostly embraced Mohammedanism. The Copts are the descendants of the ancient Egyptians who embraced and still cling to the Christian religion. Though comparatively few in number (say 600,000), their education and useful talents enable them to hold a respectable position in society. The Fellahs are generally peasants and labourers; the Copts fill the posts of clerks, accountants, &c. With those aboriginal inhabitants are mingled, in various proportions, Turks, Arabs (partly Bedouins), Armenians, Berbers, negroes, and a considerable number of Europeans. The Turks hold many of the principal offices under government. The great bulk of the people are Mohammedans, the Christians being only about 7.5 per cent. The Egyptians in the mass are quite illiterate, but under the supervision of the ministry of public instruction progress is being made. In 1898 there were about 10,000 schools with 228,000 pupils. The language in general use is Arabic. The population of Egypt in 1882 was stated at 6,820,000; by the census of 1897 it was 9,784,405, including 38,175 Greeks, 24,467 Italians, 19,557 British, and 14,155 French.

Government, Revenue, &c.—As Egypt embraces two widely different regions, namely, the broad plains of the Delta and the comparatively narrow valley of the river higher up, so it naturally falls into two parts or divisions, namely, Upper and Lower Egypt. These were anciently regarded as separate kingdoms, denoted in hieroglyphics by different crowns or royal tiaras. Whenever they were united under the same rule, the Pharaoh bore the title of 'The Lord of the two worlds'. But the lower part of the valley, which includes the Fayoum, differs widely again from the narrower portion higher up; hence the division into Upper, Middle, and Lower Egypt. The whole country appears to have been subdivided from the earliest ages into districts, or, as the Greeks termed them, *nomes*, each with a chief city. Upper Egypt, or the Said, was often named by classic writers the Thebais; and Middle Egypt, divided into seven *nomes*, the Heptanomia. The country is now divided into several governorates (the chief being Cairo and Alexandria), and into provinces or *mudiriates*, each under a *mudir* or governor. The government of Egypt is in the hands of the viceroy or khedive, as supreme ruler, who pays an annual tribute of £895,357 to Turkey, and is assisted by a ministry formed on the model of those of Western Europe. The capital is Cairo. At present there is a British army of occupation in

Egypt, and the government is carried on under the supervision of Britain, the rebellion of Arabi Pasha in 1882 having been put down and the authority of the khedive restored by British troops. For some years previous to this two controllers-general, appointed respectively by France and Britain, had extensive powers of control in the administration of the country. The British have initiated various reforms in the administration, such as the establishment of new native tribunals. The administration of justice is somewhat complicated, there being native tribunals, consular courts, mixed tribunals, and religious courts. The financial condition of Egypt is being slowly improved under British management. The public debt in 1899 amounted to about £95,600,000. The chief items of revenue are the land tax, indirect taxes, and railways. The revenue for 1899 was about £11,700,000, the expenditure was slightly smaller.

History.—The history of Egypt before the beginning of the Ancient Empire in 4000 or 5000 B.C. is almost entirely mythical. Native tradition regards this period as a time during which various gods and heroes successively ruled over the country. Most probably it was a period of internal disunion, when numerous petty kings held independent sway over small kingdoms, and it is fairly certain that the later *nomes* or counties represented in some measure the independent kingdoms of this epoch. The union of these small states into the Egyptian empire was apparently preceded by the formation of the two rival kingdoms of the Northern Land (Lower Egypt) and the Southern Land (Upper Egypt). This division was more than a mere political accident, and continued in name even to Roman times.

Manetho of Sebennytos, who wrote a Greek history of Egypt in the third century B.C., arranged all the kings of Egypt from Menes, the first historic ruler, to the Ptolemaic period, in thirty-one dynasties. This arrangement is still followed by scholars, but it is usual to group the dynasties as follows: Ancient Empire (dyns. 1-6); period of disunion (dyns. 7-11); Middle Empire (dyns. 12-14); Hyksos period (dyns. 15-17); New Empire (dyn. 18 to end). Accurate dates can be given only after 700 B.C., but the duration of these periods may be approximately given thus: Ancient Empire, 5000-4000 to 2700 B.C.; Middle Empire, 2000 to 1880 B.C.; New Empire to Macedonian Conquest, 1580 to 332 B.C.

Menes, who begins the first dynasty, is regarded as the king who first united the two kingdoms into one. The dynasty is supposed to have originated in This (Tini), probably the modern Girgeh, and in the neighbourhood, near Abydos, the tombs of eight of its kings have been excavated, whilst the names of others have been discovered. The tomb of Menes himself is supposed to have been found by De Morgan in 1897 at Nakadeh, farther up the river. In the time of the first dynasty Egypt had already made considerable progress in civilization, but traces of earlier barbarism lingered amongst the people. Menes is said to have founded Memphis. Little is known of the second dynasty, and in the third the only notable name is Zoser, who built the stepped pyramid at Sak-kara. The third and the remaining dynasties of the Ancient Empire proceeded from Memphis. The fourth (about 3000 B.C.) is a very important one. Its founder, Snefru (Snofru), had to repel Asiatic attacks. The pyramid of Meidum is his tomb. The three succeeding kings, Cheops (Hufu), Chephren (Hafra), and Mycerinus (Menkaure), are famous as the builders of the great pyramids of Giza. Under the fifth dynasty Egyptian art reached its culmination (see below). The sixth and last dynasty of the Ancient Empire comprised five kings, be-

planning with Tety or Atoty (Othoes), and including two of the name of Pepy or Apopy (Phiope). Pepy I., the founder of Memphis proper, was a warlike ruler, and essayed the conquest of Palestine. Pepy II. sent out important commercial expeditions. During the period of the sixth dynasty the central government gradually lost its authority, and at its close the monarchy was overthrown. Civil strife prevailed for a long time, and several dynasties ruled simultaneously in different parts of the country. All ultimately fell under the sway of the Theban kings (dyn. 11).

The twelfth dynasty, the first of the Middle Empire, was founded by Amenemhet I., who re-established a common government of the whole country. During the ascendancy of this house Egypt was very prosperous, and many of the buildings still in existence were erected. Literature and art were in a flourishing condition. The founder of the dynasty is said to have abdicated after escaping a conspiracy against him, and to have written in his retirement a still extant work known as the Instructions of Amenemhet. He was succeeded by his son Useratesen I., who erected a temple at Heliopolis (On), of which only an obelisk remains. His successor was Amenemhet II., who was followed by Useratesen II. The latter monarch built the pyramid of Illahun, on the borders of the Fayoum; and the present Kahun, where Petrie found valuable papyri and other antiquities, is on the site of a city founded by him for the workmen at the pyramid. The next king, Useratesen III., conquered Nubia. His successor, Amenemhet III. (Moeris of Herodotus, about 1870 B.C.), built his pyramid at Hawara, where also there are some remains of the celebrated temple or labyrinth described by Strabo and others. The next king was Amenemhet IV., and after him came Sebku-nofru, a queen, the last monarch of the dynasty. The period of the thirteenth and fourteenth dynasties was one of anarchy and confusion. A very large number of rulers sat on the throne, but few, if any, ruled over more than a part of the country, and most of them had very short reigns. The internal disunion of these dynasties prepared the way for the conquest of Egypt by the Hyksos about 1680 B.C. Who the Hyksos (formerly mis-called Shepherd-Kings) were is doubtful, but they came from Asia Minor, and reached Egypt by way of Syria. They founded an extensive empire, and afterwards granted to Upper Egypt a sort of autonomy under Theban viceroys. These viceroys are reckoned as the seventeenth dynasty. They struggled long to throw off the foreign yoke, and at length succeeded under Amosis (Ahmose) I., the founder of the eighteenth dynasty and first monarch of the New Empire. About 1583 B.C. that monarch captured Hauria (Hawaret), the last fortress held by the Hyksos, near Pelusium. The Hyksos in the main conformed to Egyptian customs, and made no important changes in Egyptian institutions and Egyptian culture.

Amosis I. not only expelled the Hyksos, but obtained a more direct control over all parts of the country than any of his predecessors had exercised. As a result Egypt now became a warlike nation bent on the conquest of neighbouring lands. Amosis himself conquered Palestine and Phœnicia, and his successor Amenophis (Amenhotep) I. (about 1570 B.C.) carried his arms far into Nubia. The next king, Thutmose (or Thothmes) I. (about 1560 B.C.), completed the conquest of Nubia, and essayed the conquest of Syria. His successor was the queen Hatshepsut, who reigned along with Thutmose II. and Thutmose (or Thothmes) III. All three have been regarded as children of Thutmose I., but their relationship is doubtful. Hatshepsut built the temple of Ammon at Dér-el-Bahri. After the death of his

co-rulers Thutmose III. reigned alone (about 1500 B.C.). He subdued Syria, and carried his arms even beyond the Euphrates. Reports of his campaigns and lists of conquered cities in Palestine have come down to us. The next kings were Amenophis II. (about 1485 B.C.) and Thutmose IV., the latter of whom dug the Sphinx of Ghizeh out of the sand which covered it. Amenophis III. (about 1450 B.C.), the next king, carried on diplomatic negotiations with princes in Syria, Babylonia, Assyria, Jerusalem, and elsewhere, and many of his despatches are preserved in the cuneiform tablets of Tell el-Amarna. He built several temples, one of them at Medinet Habu, in front of which he erected the colossi of Memnon. The reign of the next king, Amenophis IV. (1415 B.C.), is notable for the religious revolution carried out by him. He sought to weld his empire more firmly together by replacing the numerous local cults by a monotheistic worship of the sun, and the Theban worship of Ammon was specially persecuted. He abandoned Thebes, and founded a new capital near the modern Tell el-Amarna. The new religion, however, did not survive the death of its founder (about 1397 B.C.). Ay, his successor, re-established the older cults, and Thebes again became the capital.

King Ramses (Ramessu) I. is the first of the great nineteenth dynasty (about 1856). He was succeeded by Sethos (Seti, Setoy) I. (about 1850 B.C.), who had a short but distinguished reign. He built several temples, and carried on war against the Hittites (Heta). His successor, Ramses II. (Sesostris, 1840-1278 B.C.), was by far the greatest of all the Egyptian kings. He carried on the war against the Hittites with great vigour, and gained a great victory at Kadesh, on the Orontes, but he was not everywhere successful. In the twenty-first year of his reign he concluded a treaty of peace, under which Palestine was secured to Egypt and northern Syria to the Hittites. He was even more remarkable as a builder than as a warrior. To him are ascribed the temples of Luxor, Karnak, Abydos, Abū Simbel, the Ramesseum, and many others. He greatly improved the district known as Goshen by cutting a canal through it, colonising it with Syrians, and building several cities. Ramses II. has been identified with the Pharaoh of the oppression, but this is doubtful, and we learn very little indeed from the monuments regarding the Israelites in Egypt. He was succeeded by his son Merneptah (Merneptah, Amenophthos), who fought against the Libyans and Mediterranean pirates. The remaining kings of the dynasty are unimportant.

The twentieth dynasty begins with Setnaht, whose son and successor was Ramses III. (about 1200 B.C.). This latter monarch expelled the Libyans who had settled in the Delta, and fought against the Philistine pirates. He also strove to emulate his great namesake as a builder, his chief work being the temple of Medinet-Habu. He presented great wealth to the god Ammon, and in consequence the high-priest of this deity latterly became more powerful than the Pharaohs themselves. The successors of Ramses III., namely, Ramses IV., -XII., the so-called Ramessides, fell more and more under the priestly influence, and finally, about 1100 B.C., Herthor, high-priest of Ammon, seized the throne. He was soon replaced by Smendes (Nesbindedi) of Tanis (Zoan), who founded the twenty-first (Tanitic) dynasty. Before the end of the twentieth dynasty Nubia and Palestine had been lost, and the kingdom was growing steadily weaker. About the year 950 B.C. Sesonk (Sesonchis, Shishak), one of the leaders of Libyan mercenaries who had become very powerful in the state, ascended the throne as the first king of the twenty-second dynasty, and fixed the royal residence

at Bubastis. Sosenk was contemporary with Solomon, and in the time of Rehoboam he captured Jerusalem, a victory celebrated in an inscription at Karnak. Under the later rulers of the Libyan dynasty the central authority gradually declined, and in consequence the Ethiopians conquered Upper Egypt. The rest of the country was in some measure subject to kings of the twenty-third dynasty, but about 750 B.C. the Ethiopian king Pianhy defeated Tefnaht, king of Sais, and captured Memphis. Bocchoris (Bokenrenf), son of Tefnaht, reconquered what his father had lost, and founded the twenty-fourth (Saitic) dynasty in Lower Egypt. This dynasty was a short-lived one, and ended with the defeat of Bocchoris by the Ethiopian king Sabako about 706 B.C. Under Sabako, the first king of the twenty-fifth (Ethiopian) dynasty, the Egyptians assisted some small Syrian states against Assyria. His successor was Sabatoko (Sebichos, 696-691), who was followed by Taharko (Tirhakah). Taharko continued the anti-Assyrian policy of his dynasty, and consequently in 671 or 670 B.C. Sennacherib, king of Assyria, marched into Egypt, captured Memphis, and drove Taharko southwards. He restored the local kings as vassals of Assyria, and for some time all revolts and invasions from the south were unsuccessful. Of these under-kings Necho (Niku) of Sais, of the line of Bocchoris, was the chief. Psammetik (Psammetichus) I., son of Necho, succeeded his father about 663 B.C. With the aid of Greek and Carian troops he threw off the Assyrian yoke about 660 B.C., and re-established his authority over the numerous kinglets. Under his dynasty, the twenty-sixth, Egypt was very prosperous. An artistic revival began, mainly characterized by a reversion to ancient forms, and the same tendency was manifest in other departments of the national life. Psammetik's successor (609-594), Necho II. (Pharaoh-Nechoh in 2 Kings xxiii. 29), took advantage of the troubles of Assyria and conquered Syria. He defeated and slew Josiah in a battle whose site is doubtful, but in 604 Nebuchadnezzar defeated him at Carchemish. Necho II. constructed a canal from the Nile to the Red Sea, partly along the line of that made by Rameses II., and sent Phœnician ships to circumnavigate Africa. Psammetik II. (594-586 B.C.) seems to have warred against Ethiopia, and Apries (Uahebrs, Hophrah, 588-589 B.C.) assisted the Jews against Nebuchadnezzar. By this time there was a considerable intercourse between Egypt and Greece. Greek mercenaries were regularly employed by the Egyptian monarchs, and Naucratis became a Greek trading port and settlement. A military revolt placed Amasis II. on the throne in 569. His son and successor, Psammetik III. (526-525 B.C.), was defeated at Pelusium in 525 by Cambyses, king of Persia, and Egypt became part of the Persian empire. Cambyses is said to have been guilty of great cruelties in Egypt, but on the whole the Persians tried to conciliate the Egyptians by a moderate and beneficent rule. Darius I. (521-486) repaired Necho's canal and built several temples. In 487 the Egyptians successfully revolted, but Xerxes (486-465) soon reconquered them. Under Artaxerxes I. (465-425) another revolt, headed by Inarus, a Libyan, assisted by the Athenians, took place, but without success. Amyrtæus of Sais led a successful rebellion in 404, and made Egypt independent till 343. During this period three dynasties are mentioned, of which the thirtieth is the most important. To it belong Neotanebus I. (382-364), and Neotanebus II. (361-343). In 343 the Persians under Artaxerxes III. (333-338) again conquered Egypt, but in 332 B.C. they were driven out by Alexander the Great, with whom begins a new period, the Græco-Roman, in the history of the country.

When Alexander's army occupied Memphis the numerous Greeks who had settled in Lower Egypt found themselves the ruling class. Egypt became at once a Greek kingdom, and Alexander showed his wisdom in the regulations by which he guarded the prejudices and religion of the Egyptians. He founded Alexandria as the Greek capital, and this city became the great centre of commerce and Greek civilization that it long continued to be. Alexander died in 323, and Ptolemy, one of his generals, became governor of the country. In 305 he declared himself king of Egypt, and founded the Ptolemaic dynasty, which ruled in Egypt for well-nigh three hundred years. Under the Ptolemies Greek literature, science, and art flourished, but the writers of the Alexandrian school (which see) fell far indeed behind those of the palmy days of Greece. It was in the early days of the Ptolemies that the famous Greek version of the Bible—the Septuagint—appeared. Latterly the Græco-Egyptian state began to decline, Roman influence made itself felt, Egypt became involved in the civil wars of Rome, and after the battle of Actium (30 B.C.), in which the famous Cleopatra took an inglorious part, it was made a Roman province. (See PTOLEMY, CLEOPATRA.) The Egyptians had continued building temples and covering them with hieroglyphics as of old; but on the spread of Christianity the older religions lost their sway. Now arose in Alexandria the Christian catechetical school, which produced Clemens and Origen. Monasteries were built all over Egypt; Christian monks took the place of the pagan hermits, and the Bible was translated into Coptic.

On the division of the great Roman Empire (A.D. 337), in the time of Theodosius, into the Western and Eastern Empires, Egypt became a province of the latter, and sank deeper and deeper in barbarism and weakness. It then became the prey of the Saracens, Amru, their general, under the Caliph Omar, taking Alexandria, the capital, by assault. This happened A.D. 640, when Heraclius was the emperor of the East. As a province of the caliphs, it was under the government of the celebrated Abbasides—Harun-al-Rashid and Al-Mamon—and that of the heroic Sultan Saladin. The last dynasty was, however, overthrown by the Mamelukes (1240), and under these formidable despots the last shadow of former greatness and civilization disappeared. Selim, sultan of the Turks, eventually (1516 to 1517) conquered the last Mameluke sultan, and Egypt became altogether a Turkish province, governed by a pasha. After this it was the theatre of internal wars by the Mameluke boys against the Turkish dominion, which was several times nearly extinguished. Confusion and civil war between the different factions of the Mamelukes continued to prevail until 1798, when the French invasion under Napoleon Bonaparte united their chiefs in self-defence; but the Mameluke army was all but annihilated in the battle of the Pyramids. The French now conquered the whole of Egypt and held it till 1801, when they were driven out by the British under Abercromby and Hutchinson.

On the expulsion of the French the Ottoman Porte effectually urged its claim to sovereignty, and the young officer commanding the Turkish forces, Mohammed (or Mehmet) Ali, contrived to have himself appointed Pasha of Egypt and to shorten the road to absolute power by entrapping and treacherously murdering the Mameluke leaders (1811). He consolidated his power in Egypt, and extended his rule beyond it, annexing to his dominions all that part of Arabia bordering on the Red Sea, while on the Nile his conquests extended to Sennar and Kordofan. At length he broke openly with the Porte,

overran and took possession of Syria, but finally had to give up this territory, obtaining from the Sultan, however, in 1841, a firman confirming to him the viceroyalty of Egypt, as a fief of the Ottoman Empire, hereditary in his family. Mohammed Ali had divested himself of many of the prejudices of his countrymen, employed Europeans in the administration of his dominions, and followed European models to a large extent, though the government still remained an unqualified despotism. Having abolished the right of private individuals to hold property in land, he became the proprietor of the whole kingdom (houses and gardens excepted). The Fellahs received wages, sowed their fields, as they were ordered by the government, carried their produce to the government stores, and were paid for it at the government price. Thus Mohammed Ali took into his own hands all the agriculture, as well as all the manufactures of the kingdom. In 1849 he was succeeded by his grandson Abbas, who, dying in 1854, was succeeded by his uncle Said, son of Mohammed. Under his rule railways were opened, and the cutting of the Suez Canal commenced. Said's successor, Ismail Pasha, obtained the government in 1863. Ismail began his reign by taking various steps to develop commerce, improve the administration of justice, and suppress slavery, but his extravagance both in his public and private expenditure brought the finances of the country into a state of utter disorder. One of the most important events of his rule was the completion of the Suez Canal in November, 1869. Under him Egypt made large accessions of territory in the south. The condition of the finances led to the establishment of 'dual control' by Britain and France, and in 1879 Ismail was forced to abdicate under pressure of the British and French governments, and was replaced by his son Tewfik. His position was soon threatened by the so-called 'national party' with Arabi Pasha at its head, who aimed at his deposition and at the abolition of European intervention. In May, 1882, a rising took place in Alexandria, when many Europeans were killed and their houses pillaged. The khedive fled from Cairo, where Arabi remained autocrat. The French refusing to interfere, Britain now determined to act, and on July 11 a British fleet bombarded the forts at Alexandria, causing the rebels to retreat. In August a force under Sir Garnet (now Lord) Wolseley landed at Ismailia, and on September 13 Arabi's forces were totally defeated at Tel-el-Kebir, and the rebellion crushed, Arabi and his associates being banished. Before this a rebellion against Egyptian rule had broken out in the Soudan under the leadership of Mohammed Ahmed, who professed to be a Mahdi or divinely-sent Mohammedan conqueror. His followers soon became numerous, defeated Egyptian troops that opposed them, and threatened the existence of all the Egyptian garrisons in the Soudan. In 1883 they annihilated an Egyptian force under Hicks Pasha near El Obeid in Kordofan, and in 1884, Osman Digna, as representing the Mahdi, defeated another force under Baker Pasha near Suakim. British troops were now despatched to Suakim, and at El Tob and Tamai severe defeats were inflicted on the Arabs by General Graham. Meantime General Gordon had been sent to Khartoum to withdraw the garrisons from the Soudan, but he was shut up in the town for nearly a year, and perished before the relief expedition under Sir Garnet Wolseley could reach him (Jan. 1885). The Soudan was then given up, and the southern boundary of the Egyptian dominions fixed at Wady Halfa. (See SOUDAN.) In 1892 Tewfik died, and was succeeded by his son

Abbas Hilmi. In 1896 an Anglo-Egyptian expedition for the reconquest of the lost provinces was despatched under Sir Herbert (now Lord) Kitchener. Dongola was soon occupied. Abu Hamed was captured in the following year, and on April 8th, 1898, the insurgents were defeated in a battle near the confluence of the Atbara. Finally, on Sept. 2nd, 1898, the forces of the Khalifa, as the Mahdi's successor was called, were defeated with great slaughter at Omdurman, beside Khartoum. The territory thus reconquered has been placed under a governor-general, and is being rapidly organised. A subsequent attempt of France to occupy Fashoda and enforce a claim to the Bahr-el-Ghazal valley led to some friction with Britain.

Ancient Civilization.—The civilization of Egypt had reached an advanced stage 4000 years before the Christian era. Even before the year 2000 A.C. the Egyptians had duodecimal as well as decimal numbers, and weights and measures adjusted to a pound of 1400 grains. The division of the year into twelve months of thirty days, the year being divided into three periods of four months each—the period of inundation, the period of vegetation, and the period of harvest; their statuary and painting; their ornaments of gold and silver; their musical instruments—all bear witness to the advances already made by the Egyptians in science and art. In mechanical arts, the carpenter, boat-builder, potter, leather-cutter, glass-blower, and others, are frequently represented on their ancient monuments; and we see the blow-pipe, bellows, and siphons; the press, balance, lever; the saw, the adze, the chisel, the forceps, the syringe, harpoon, razors; we have also glazed pottery, the potter's wheel, and the kiln; and dated specimens of glass of the time of Thothmes III. (1445 A.C.). Gold-beating, damascening, engraving, casting, inlaying, enamelling, wire-drawing, and other processes were practised. In warfare, shields, cuirasses of quilted leather, helmets, spears, clubs, maces, daggers, bows, battle-axes, pole-axes, hatchets, and falchions; for sieges the testudo, ladders, torches, and lanterns were in use. In agriculture the plough, hoe, sickle, and other implements were employed. The processes of growing and preparing flax, and making it into thread, string, ropes, and cloth, as well as the looms employed, are all depicted. Mats and baskets were beautifully made, either of the halfed grass or palm leaves, or of the outer rind of the papyrus plant, which was used in making paper. Coffins or wooden sarcophagi were chiefly of sycamore or cedar, covered with stucco and richly painted. The ordinary boats of the Nile were of planks of the acacia, and had two rudders or large oars, with a sail of cloth frequently painted or worked in coloured patterns. Many of the vessels of burden were of great size. The boats made of papyrus were mostly punts for fishing, or for gliding through the canals of the Delta. Implements for painting, ladles, bells, crucibles, and surgical instruments have also been found. The commerce of the Egyptians with neighbouring nations enriched the country with slaves, cattle, gems, metals, rare animals, and objects of curiosity. The Egyptians expended enormous wealth on the tombs and furniture of the dead, and the paintings acquaint us fully with the various ceremonies followed. In embalming they excelled. There was a well-developed system of civil and political government, of civil and criminal law. The condition of women appears to have been superior to what it was in any nation of antiquity.

Ancient Religion.—Two main features of the religion of Egypt were the worship of the heavenly bodies and of a multiplicity of local deities. Imagin-

any gods held offices relating either to the duties or future state of mankind. Geni of the nomes, cities, or rivers were worshipped as gods, and each month and day was consecrated to a deity. Sacred animals were worshipped, as being chosen by the deities for their abode or visible representative on earth, Apis being one of the most prominent, the sacred bull of Ptah. The divinity often formed a triad along with a wife and a son. The great triads were composed of the principal divinities, the first two members being frequently of equal rank, and the third subordinate, as in the case of Osiris, Isis, and Horus. Other triads are formed of deities of an inferior class; and occasionally a sort of triad was composed of two deities and the king. While the worship of some of the triads was peculiar to particular places, the worship of others was universal—that of Osiris, Isis, and Horus, for example, having prevailed all over Egypt. Among the chief deities other than those mentioned were: Re (Ra) or Re-Harmakhis, the sun-god of Heliopolis; Ammon-Re (Amen-Ra), also a sun-god, the national god under the Middle Empire; Hathor, goddess of joy and love; Anubis, a god of the dead; Thout or Thoth, a moon-deity. The Egyptians believed in an author of evil, who was called Set, or by the Greeks Typhon; and the antagonism of good and evil is shown by the hostility between Osiris and Typhon. The Egyptians believed in the transmigration of souls and in the existence of a future state in which mankind would be rewarded or punished according to their actions while on earth. There are also distinct allusions to a resurrection of the body, and the embalming of the dead (see MUMMIES), and the provision of various articles for the deceased in the tomb, including a copy of the Book of the Dead, as a sort of guide in the other world, all had reference to this belief. Details and illustrations bearing on this subject will be found in Wilkinson's *Ancient Egyptians*, as well as in other works referred to below.

Ancient Architecture, Sculpture, &c.—The monuments we have left to us in Egypt are of two periods—those built in the times of the Pharaohs, and those built during the sway of the Greek and Roman rulers of the country. Although the temples of the two periods differ considerably in plan and in other particulars, there is yet sound reason for believing that those built under the Greeks and Romans were constructed after designs, as they certainly occupy the sites, of Pharaonic temples still more ancient than any now existing; that they were, in fact, mere restorations of temples built by the earlier Pharaohs.

The leading features of the now existing temples of the time of the Pharaohs are these: First, a gateway or pylon, flanked by two truncated pyramids. These occupy the entire width of the building, and form the entrance to a square court, surrounded by a portico supported by a double or single row of columns. Crossing this court the visitor passes through a second pylon into the inner court, which was likewise surrounded by a portico supported either by columns or by piers, against which were figures of the king. Beyond this second court it would appear the public were not admitted, for the spaces between the front row of columns or piers facing the gateway are occupied by a dwarf wall, which effectually barred entrance excepting at either one or three points where there were gates. This inner court led immediately into the largest chamber of the temple, called the *Hall of Columns*, the roof of which was always supported by columns representing a grove of papyrus. The centre avenue was higher than the rest of the hall, and consisted usually of twelve columns, the capitals being imitated from the full-blown expanded papyrus, while the columns

which sustained the lower roof were in the form of a bud of the same plant. To the Hall of Columns succeeded a series of smaller chambers, the roofs of which were generally supported by six or four columns, imitating the bud of the papyrus, either as a single plant or as several bound together; or else by square piers, or columns with eight, twelve, or sixteen faces. These apartments frequently surrounded a dark chamber—the most sacred in the temple—the holy of holies. Whether the roof of the portico which surrounded the court was supported by piers or columns, the structural arrangements were always precisely the same. There was first the pier or column, ordinarily made of several pieces of stone solidly united by mortar and wooden cramps; then came the architrave or frieze, of one block, stretching from column to column; and lastly, the blocks forming the cornice, concealing the ends of the roof stones which rested upon the architrave. The bulk of the column, in proportion to the weight it had to sustain, was extremely ample; and the pressure being always perpendicular, these ancient structures have come down to us with their roofs sound, while arched buildings of much less antiquity have been entirely ruined by the lateral pressure which that mode of construction exerts on the walls. The Egyptian gate was peculiarly simple. The lintel was always of one stone, and the door-posts also were very frequently of only one block, while each of the three portions had its appropriate decoration. Above the entrance was sculptured the winged globe or protecting divinity of entrances, with the names of the divinities to whom the temple was dedicated, and of the Pharaoh who built it. The door-posts also bore the name and title of the builder. The surface of each architectural feature was engraved with its particular ornament appropriately coloured. In the *cavetto*, or hollow moulding of the cornice it was customary to place the name and titles of the Pharaoh or king, with the other significant decorations peculiar to that member of the entablature. The next member, the *torus* or *bead*, had its special decoration; and the architrave stone was likewise symbolically ornamented with the names of the divinities to whom the temple was dedicated, and of the sovereign in whose time it was built. The abacus of the column was invariably decorated with the royal titles. The capitals were painted in accordance with the intention of the form; if, for instance, the expanded papyrus, the leaves of the calyx would be yellow and the filaments green. Beneath were five horizontal divisions, which probably represented the blue and white bands with which the columns of the primitive temples were adorned on festive occasions. To these succeeded a representation of the king offering gifts to the gods of the temple; and lastly, the yellow and red lines at the base of the shaft signified the brown leaves that envelop the base of the stalk of the natural plant. A further intimation of the origin of this order of Egyptian column is the presence of three ridges extending up the shaft to the bands of the neck of the capital, by which the triangular form of the stalk of the plant was intended to be signified.

The temples built during the reigns of the Greek and Roman rulers may be thus described. First, the propylon, with its truncated pyramidal towers, which were sometimes adorned with narrow flags on tall poles; then a court surrounded on three sides with a colonnade. At the extremity of the court, and facing the gateway, was an elevated portico of six columns in line, and three or four deep. The uninitiated obviously were not permitted to enter beyond the court, for the columns of the first row of the portico are invariably joined by a dwarf wall, the only opening being between the centre intercolumniation, to which

were attached the valves of the gate. To the portico succeeded a series of small chambers, the roofs of which were supported by four or by two columns. The centre chambers were lighted by small square openings in the roof, and those at the side by small openings in the walls; but in no example is there that kind of clere-story perforated with large openings, that occurs in the Hall of Columns of the Pharaonic temples. Besides the foregoing characteristics, there is an elaborate form of capital, representing the papyrus in three stages of growth, in one capital, or sometimes a collection of lotus flowers, or the full-blown papyrus alone; but in no instance do we find the pier with the attached figure, nor the single bud of the papyrus, nor that form of column which represents several buds of the plant joined together. The palm-tree capital, however, belongs to both periods. Another distinguishing feature of the Ptolemaic temples is, that the masonry is even more perfect than that of the time of the Pharaohs, if we except the pyramids and the granite temples of Lower Egypt. The temples of the Roman period are usually inferior in extent to the Ptolemaic buildings; they are also remarkable for a yet more elaborate form of capital, more salient and curvilinear forms in the sculpture and architectural decorations, and a still more perfect masonry. Granite seems rarely to have been employed for architectural purposes in any part of Egypt excepting the Delta. In the Thebaid it was used chiefly for sculpture, the ordinary building material being the limestone of the district, or the fine sandstone of the quarries of Silsilis.

Among the most remarkable structures erected by the ancient Egyptians are the great pyramids, erected to serve both as monuments and as tombs. (See PYRAMIDS.) Strong buildings containing one or more rooms were also erected as tombs, in which food and other articles were deposited for the use of the dead, the inner walls being embellished with inscriptions and representations, and statues of the dead being also placed in the interior. Tombs cut in the rock were also common. In connection with architecture should be mentioned the obelisks, the oldest known being erected by Useresen I. Sphinxes, often forming avenues, were a common accessory of temples, the greatest being that known as the Sphinx, a colossal companion of the pyramids of Gizeh. In portrait sculpture the Egyptians attained extraordinary perfection at an early date, the skill with which they worked in hard stone, such as diorite and basalt, being surprising. Some of the early statues are of colossal size, but a higher style of art is shown in those of ordinary size, though a certain conventional treatment is always apparent. The most usual kind of mural sculpture, a kind peculiar to the Egyptians, is that known as hollow or sunk relief (*cavo-rilievo*). The general outline of the object intended to be represented is cut into the smooth surface of the stone, while at the same time the minor forms and roundness are represented within the incised outline. By this contrivance the details of the sculptures are protected. Sometimes the outline is excessively deep, at others the surface of the figures is altogether much lower than the general surface of the wall, and in others the outline is but slightly incised with a corresponding flatness within. Wherever the Egyptians practised the true bas-relief the sculpture is almost invariably in very low relief. The back view of the human figure is never represented in the sculptures excepting in the case of an enemy, and then rarely; the figure is generally represented in profile, and there are but few attempts at delineating the front view of the foot or of the face; however, whether the face be represented in front or side view, a profile eye

is never found. The figures of the king in battle-pieces, and of the landed proprietor in domestic scenes, are always on a much larger scale than the other actors in the piece. Statues and reliefs were always painted, and when wall painting is employed it is always as a substitute for sculpture. There is no proper perspective, and certain conventionalities of colour are employed. The Egyptians are represented with red and yellow complexions, red ochre for the men and yellow for the women. The hair of the king is frequently painted blue, but that of ordinary men black. In representing the various nations with whom Egypt had intercourse, the artists seem to have endeavoured to imitate the complexions peculiar to each. Ammon-Ra, the chief divinity of Thebes, is always painted blue, and he is further distinguished by two high feathers which he wears in his cap. The inferior deities are not uncommonly of the complexions of mortals. The sky or heavens are invariably indicated by a strip of blue coming downwards at the lower side of each extremity, and occasionally having upon it a row of five-pointed stars. Water, seas, and rivers are represented by zigzag lines of a blue or green colour. Mountains have a yellow colour, with red spots upon it. Egyptian art was at its highest during the period between dynasties four and six, and notwithstanding its defects it was superior to that of Nineveh and Babylon.

For an account of the hieroglyphics so abundantly employed by the ancient Egyptians, and for the system of writing developed out of these characters, see HIEROGLYPHICS. By the study of the hieroglyphics on the monuments, and of the ancient papyrus documents discovered, and by investigations and excavations of various kinds, especially those supported by the Egypt Exploration Fund, our knowledge of ancient Egypt has vastly increased in recent times. A considerable body of ancient Egyptian literature exists, consisting of didactic and religious writings, books on magic, chronicles of the reigns of kings, entertaining tales, love songs, and other popular poetry, &c. Even Greek literature has been enriched by the discovery of papyri containing portions of classic authors.

Among works on Egypt, ancient and modern, the following may be mentioned: Sir J. Gardner Wilkinson, *Manners and Customs of the Ancient Egyptians* (new edition, 1878); E. W. Lane, *Manners and Customs of the Modern Egyptians* (new edition, 1882); Erman, *Life in Ancient Egypt* (1894); Wiedemann, *Religion of the Ancient Egyptians* (1897); Perrot and Chipiez, *History of Art in Ancient Egypt* (1883); Maspero, *Egyptian Archaeology* (1887); the same writer's, *Dawn of Civilization in Egypt* (1896), and *The Struggle of the Nations* (1896); Brugsch, *Egypt under the Pharaohs* (1874); Ebers, *Egypt, Descriptive, Historical, and Picturesque* (1887); G. Rawlinson, *History of Ancient Egypt* (1881); Flinders Petrie, *History of Egypt* (1894-); the same writer's, *Egyptian Decorative Art* (1895), and other works; Milner's *England in Egypt* (1899); Mahaffy, *Empire of the Ptolemies* (1895); *Reports of the Egypt Exploration Fund*; Murray's & Baedeker's *Handbooks*, &c.

EGYPTIAN VULTURE (*Neophron peronotus*), a well-known bird which frequents both shores of the Mediterranean. It is the scavenger of Egyptian villages, collecting in numbers where carrion or garbage may attract it. The birds usually go in pairs, however, and addict themselves to particular localities, being only drawn together in numbers by abundance at any point of their favourite food. See VULTURE.

EHRENBREITSTEIN, an important German

fortress, on a rock 370 feet high, overhanging the Rhine, opposite Coblenz, with which it communicates by a bridge of boats and an iron railway bridge. It was blockaded by the French in 1798 and 1799, till at length it was obliged to surrender for want of provisions, January 29, and in 1801 was blown up. It was afterwards ceded to Prussia (1814). The fortress, rebuilt on Montalembert's system in 1816-26, at an expense of about £1,200,000, can accommodate a garrison of 14,000 men. A well, communicating with the Rhine, is sunk through the rock. Ehrenbreitstein is considered one of the finest fortresses in the world. The small town of Ehrenbreitstein lies at its foot. (See COBLENTZ.) Pop. (1895), 5214.

EICHORN, JOHANN GOTTFRIED, German theologian and orientalist, born in 1752, after studying at Göttingen, became rector of the school of Ohrdruff, near Gotha, in 1775 professor of oriental languages at Jena, in 1788 at Göttingen, where he became in 1811 Doctor of Divinity, and in 1813 joint-director of the Royal Society of Sciences. He died in 1827. He edited a Repertory of Biblical and Oriental Literature (eleven vols. Leipzig, 1777-86), and a Universal Library of Biblical Literature (ten vols. Leipzig, 1787-1803); and wrote *Historico-Critical Introductions to the Old and to the New Testament*, and to the Apocryphal Books of the Old Testament, a Latin Commentary on the Apocalypse, &c. He latterly occupied himself chiefly with ordinary and literary history.

EICHSTÄDT, or EICHSTÄTT, a town of Bavaria, in Middle Franconia, in a deep valley of the Altmühl, 67 miles N.W. of Munich. It is an old place and an early seat of German Christianity, St. Boniface having consecrated the Anglo-Saxon Willibald as Bishop of Eichstädt in 741. Its principal edifices are a fine cathedral, partly Romanesque, partly Gothic, founded in 1042, adorned with beautiful stained glass and several good paintings, and containing the tomb of St. Willibald; several other handsome churches, an old town-house with a square tower, a Capuchin monastery, a Benedictine nunnery, and the old castle of Willibald, formerly residence of the prince-bishops. There are fine public gardens and pleasure-grounds. Pop. (1895), 7722.

EIDER, a river of Prussia, in Schleswig-Holstein, which rises about 12 miles from Kiel, flows first north-west, then west with many windings, and after a course of 112 miles, of which 69 are navigable, falls into the North Sea at Tönning. By its junction with the Schleswig-Holstein Canal it gave communication between the North Sea and Baltic, but the Kaiser Wilhelm ship canal is now used, and the old is dry.

EIDER DUCK (*Somateria mollissima*, illustrated at ORNITHOLOGY). This valuable swimming-bird is found in northern and arctic regions, both in Europe and America. Its favourite haunts are solitary rocky shores and islands. In Greenland and Iceland they occur in great numbers, and they breed as far south as the Farne Islands on the Northumberland coast. In particular spots their nests are so abundant that a person can scarcely walk without treading on them. Their nests are usually formed of grass, dry seaweed, &c., lined with a large quantity of down, which the female plucks from her own breast. In this soft bed she lays five eggs, which she covers over with a layer of down; then the natives, who watch her operations, take away both the eggs and the down: the duck lays a second time, and again has recourse to the feathers of her body to protect her offspring; even this, with the eggs, is generally taken away; and it is said that in this extremity, her own stock being exhausted, the drake furnishes the third quan-

tity of down; but some of the most competent authorities deny this statement. One female generally furnishes a few ounces of down. This down, from its superior warmth, lightness, and elasticity, is preferred by the luxurious to every other article for beds and coverlets; and, from the great demand for it, those districts in Norway, Greenland, and Iceland where these birds abound are regarded as the most valuable property, and are guarded with the greatest vigilance. Proprietors endeavour to attract them by supplying artificial nests and otherwise, and when they settle in an island off the shore, cattle and herdsmen are removed to allow them to breed undisturbed. Very little of the eider down remains in the countries where it is collected. As found in commerce this down is in balls of the size of a man's fist, and weighing from 3 to 4 lbs. It is so fine and elastic, that 5 lbs. of the best quality is sufficient for a whole bed. The down from dead birds is little esteemed, having lost its elasticity. The length of this duck is 2 feet 3 inches, extent of the wings 3 feet, weight from 6 to 7 lbs.; the head is large, and the bill of singular structure, being 3 inches in length, forked at the base of the upper mandible in a remarkable manner, running high up on the forehead, and having the feathers on each side descending nearly to the nostrils: the whole of the bill is of a dull, yellowish horn colour, somewhat dusky in the middle. The male is black beneath, head and back white, with a black crown. The female is reddish drab, spotted with black, with two white bands across the wings. The young of both sexes are the same, being covered with a kind of hairy down, throat and breast whitish, and a cinereous line from the bill through the eyes to the hind head. These birds associate in flocks, generally in deep water, diving to great depths for shell-fish, which constitute their principal food. They live much on the water, retiring to the shores to rest, particularly on the appearance of an approaching storm. Their flesh is eaten, but tastes strongly of fish. The eggs, however, are esteemed. These and the down are both frequently obtained at the hazard of life by people let down by ropes from craggy steepes. The king-eider (*S. spectabilis*) differs somewhat from the common eider, but its range seems to be much the same. There are also one or two other species.

EIFFEL TOWER, a structure erected on the Champ-de-Mars, Paris, in connection with the exhibition of 1889, after the designs of M. Eiffel, a French engineer, the cost being defrayed partly by funds provided by him, partly by public funds. Its height is 300 metres or 984 feet, and it is built in three stages, each narrowing upwards to the top, which may be reached by stairs or lifts. See PARIS.

EIGG, an island on the west coast of Scotland, county of Inverness, about 10 miles from the mainland, and 5 miles long by about 3 broad. It presents bold, rocky shores, and at its south extremity terminates in a lofty promontory called the Scur of Eigg, with a peak of columnar pitchstone porphyry 1359 feet above the sea, and on one side perpendicular as a wall. In one of the numerous caves found along the coast the M'Donalds, the inhabitants of the island, took refuge from the pursuit of their enemies, the M'Leods of Skye. The latter kindled fires at the mouth of the cave (which is so narrow that it can only be entered by creeping on hand and knees), and suffocated the M'Donalds, whose whitened bones in the cave still attest the truth of the tragedy. The island has a population of 291, chiefly engaged in rearing cattle.

EIKON BASILIKÉ (Greek, the royal image), the name of a book professedly written by King Charles I., and by some believed to be really his

work, while others attribute it to John Gauden, D.D., dean of Booking, afterwards bishop of Exeter and then of Worcester. It appeared shortly after the execution of Charles I. in January, 1649, and was naturally supposed to have been written by the king himself. At the Restoration Gauden laid claim to the authorship, and a memorandum by the Earl of Anglesea, lord privy-seal under Charles II., written in his copy, stated that the work in question 'was none of the said king's compiling, but made by Dr. Gauden, which I here insert for the undeceiving others in this point, by attesting so much under my hand'. The earl says he had the authority of Charles II. and the Duke of York for this statement. Mrs. Gauden also claimed it for her husband. Some believe that the bishop wrote the book, but that the king may have revised it while a prisoner. It is said that 48,000 copies were sold within a year of its publication. The royalists considered it the noblest prose work in the language, and the republicans put forward their noblest literary champion to answer it. The Eikonoklastes of John Milton appeared the same year, by order of Parliament. The Eikon Basilikē professes to be a sort of private journal of the king. It is written in an affectedly dignified strain, which wears by its monotony and displeases by its artificiality. In it, as in all the productions of deposed monarchs, are found numerous assertions of his love and tender care for his either misguided or ungrateful people Gauden was born in 1606, and died in 1662. Internal evidence seems strongly in favour of his claims. See papers by C. E. Doble in The Academy for May and June, 1893.

EILDON HILLS, three picturesque, conical-shaped hill summits belonging to a single mass, south of Melrose, in Roxburghshire, Scotland. The highest attains an elevation of 1385 feet above sea-level, and all command a splendid prospect, rich in historic and legendary associations.

EILENBURG, a town of Prussian Saxony, in the government and 26 miles N.W. of Merseburg, mainly situated on an island of the Mulde, communicating with the shore by two bridges. It consists of the town proper and several suburbs, contains two Protestant and a R. Catholic church, and has manufactures of calico, woollen cloth, chemicals, &c. Pop. (1895), 13,399; (1900), 15,147.

EINBECK, or **EIMBECK**, a town of Prussia, in the province of Hanover, on the Ilme, near its junction with the Leine, 40 miles south of Hanover. It carries on several industries, and the formerly celebrated Einbecker Bier ('bock' beer) is still made here. Einbeck was a place of importance in the fifteenth century. It was a member of the Smalkaldic League, and it figured prominently in the Thirty Years' and the Seven Years' Wars. There are still remains of its old walls and towers. Pop. (1895), 8436.

EINSIEDELN, a village of Switzerland, celebrated as a resort of pilgrims, in the canton and 9 miles north by east of Schwyz. It is celebrated for its Benedictine abbey, which stands about 3000 feet above the village. It was founded in the ninth century, but the buildings have been several times destroyed by fire. The present buildings, esteemed among the finest in Switzerland, were only erected in 1704-19. They are in Italian style, and are about 150 yards in length. An image of the Virgin, alleged to possess miraculous powers, annually attracts immense numbers of pilgrims to the dedication festival, at which, however, in 1517, Zwinglius preached with such effect against pilgrimages, indulgences, and monastic vows that the monks laid aside their cowls, and the abbey was for a time almost

deserted. There is a fountain of black marble, with fourteen jets, bearing an image of the Virgin. The treasury was despoiled by the French in 1798. There is a valuable library, consisting of 40,000 volumes and numerous manuscripts, in connection with the abbey. The village contains many hotels and inns, and its chief industry is the manufacture of articles esteemed by pilgrims, and by Roman Catholics generally, partly for exportation (such as crucifixes, images of saints, rosaries, &c.). Paracelsus was born at Einsiedeln. Pop. (1900), 8551.

EISENACH, a town of Germany, in the Grand-Duchy of Saxe-Weimar, finely situated at the north-west end of the Thuringian Forest, at the confluence of the Nesse with the Horsa, 17 miles west of Gotha. In the market-place there is a monument to the memory of those from the neighbourhood who fell in the war of 1870-71, and in the Karlsplatz stands the Luther memorial, unveiled in 1895. The oldest church is the Nikolaikirche, built in 1150, restored in 1887, with an octagonal tower, but the largest church is the Marktkirche, in late Gothic style. Other buildings and institutions of note are: the former ducal palace; the seventeenth-century town-hall; the gymnasium and other educational institutions; the fine theatre, giving name to Theaterplatz; the Reuterhaus, now a Wagner and Reuter museum; an orphanage; hospitals; house of correction, &c. The manufactures are extensive and comprise colouring materials, white-lead, woollens, beer, leather, pottery, tobacco, oil, machinery, &c. Fish culture is also carried on. The town has many interesting historical associations. Luther was at school here, and Sebastian Bach, to whom there is a statue, was born here. Near it is the Wartburg, where Luther resided for a time for safety. Eisenach was formerly the capital of a principality of the same name. Pop. (1895), 24,346; (1900), 31,553.

EISK. See **LEISK.**

EISLEBEN, a town of Germany, in Prussian Saxony, 18 miles to the west of Halle, famous as the place where Martin Luther was born and died. Of the churches, the chief are the Andreaskirche, restored in 1877, and the Peter-Paulskirche, both of them containing numerous interesting objects. The royal gymnasium, originally founded by Luther, was rebuilt in 1883. The house in which the reformer died is situated opposite the Andreaskirche, and has been recently restored. In 1883, on the occasion of the celebration of the four-hundredth anniversary of Luther's birth, a statue of him was unveiled in the market-place. Copper and silver are mined in the neighbourhood of Eisleben, and among the manufactures of the town are malt, shoes, beer, &c. A considerable trade in flower and vegetable seeds is carried on. Pop. (1900), 23,900.

EISTEDDFOD (Welsh), the name of an assembly of Welsh bards for the purpose of musical and poetical contests. They were held at different places for the minstrels of their respective neighbourhoods; at Caerwys, at Aberffraw in Anglesea, and at Mathravel in Powys. The judges were appointed by commissions from the native princes, and after the conquest from the English kings. The last was issued in 1568; but the ancient custom has been again revived by the Gwyneddigion and Cambrian Societies, and annual meetings for the recitation of prize poems and performances on the harp are now held under the name of Eisteddfod. The Eisteddfod proper was announced a year and a day beforehand at an assembly called a Gorsedd.

EJECTMENT, an action at law to recover possession of land or house property wrongfully withheld, and to cause the person withholding it to remove. If a tenant refuses to quit a house or

apartments after his period of tenancy has expired, the landlord may bring an action of ejectment against him. Formerly the term ejectment was specially applied to a peculiar action by which a person ousted from the possession of an estate for years might recover that possession. The whole action was a remarkable assemblage of fictions, and even the nominal plaintiff and defendant were non-existent persons, called respectively John Doe and Richard Roe. This form of fictitious action was abolished by the Common Law Procedure Act of 1852, and a simple writ substituted for it. The Judicature Acts changed the name of the action to *Recovery of Land*. The action commences by a simple writ, addressed to the tenant in possession, and to all persons entitled to defend the possession, setting forth that the plaintiff has asserted a claim to the land, and calling upon those interested to appear within a certain time to defend their right. The writ contains a notice that in default of appearance the tenant in possession will be ejected. Ejectment of any kind may be brought in the County Courts when the annual value of the property does not exceed £20.

EKATERINBURG, or **IEKATERINBURG**, a town of Russia, in the government and 170 miles S.E. of Perm, on the E. side, and in the mining district of the Ural Mountains. It was founded in 1723 by Peter the Great. It consists of two distinct parts, on opposite sides of the Isset, communicating by a handsome bridge. The houses are of wood or stone, arranged in spacious and well-formed streets. It has a mint, arsenal, custom-house, mining-school, hospital, and botanic garden. The art of cutting, polishing, and engraving gems, which are found in the neighbouring mountains, is here carried to great perfection, and, together with mining and metallurgy, and a commerce in cattle and cutlery, forms the chief occupation of the inhabitants. Pop. (1897), 43,052.

EKATERINOSLAV, or **IEKATERINOSLAV**, a town, Russia, capital of a government of the same name, on the right bank of the Dnieper, 250 miles N.E. of Odessa. It was founded in 1787 by Prince Potemkin, as a summer residence for the Empress Catherine II. It has a cathedral, a public library; is the see of an archbishop, and the seat of several important public offices; and it carries on a large trade with Odessa. Pop. (1897), 121,216.—The government of the same name has an area of 26,148 square miles and a population (1897) of 2,112,651.

ELAIN, Chevreul's name for the oily principle of fat obtained by submitting fat to the action of boiling alcohol, allowing the stearin to crystallize, and then evaporating the alcoholic solution; or by the simple process of pressing any oily or fatty substance between folds of bibulous paper, the oily matter or elain is absorbed, while the stearin remains. The paper being then soaked in water and pressed, yields up the elain. It possesses much the appearance and properties of vegetable oil, is liquid at the temperature of 60° Fahr., and has an odour derived from the solid fats from which it has been extracted. It is readily soluble in alcohol, and forms soaps with alkalies; in doing which, however, it undergoes decomposition, the oleic acid which it contains combining with the alkali employed.

ELAND, *Oreos Canina*, a species of antelope inhabiting Africa, the largest of all the antelopes, being about the size of an ox. Its flesh, especially the thighs, which are dried and used in this state, is highly prized, and consequently the animal is now nearly exterminated in the neighbourhood of the Cape Colony, where it was once common. The colour is a light or grayish brown, and it possesses a short mane.

ELASTIO BITUMEN, **ELATERITE**, or **MINERAL CAOUTCHOUC**, a substance first obtained in the Peak of Derbyshire, in a closed-up mine. It is black, usually dead and lustreless externally, but when broken across has a peculiar dark-green colour, yellowish where thin, with a resinous lustre, sometimes soft, flexible and elastic, at other times tolerably hard and rigid, with a very peculiar smell. It burns readily with a bright light, smoky flame, and bituminous odour. It is able to efface pencil-marks. It has been found at other places besides the locality above-mentioned—at St. Bernard's Well, Edinburgh, in France, Zante, and at Neufchatel.

ELASTICITY is the property in virtue of which bodies resist change of volume and change of shape, and in virtue of which they return to their original volumes and shapes when compressing and distorting stresses are removed from them. The former is called elasticity of volume, the latter elasticity of shape. The name *Compressibility* is also used in connection with the elasticity of volume; and *Rigidity*, or resistance to change of shape, in connection with the latter. Fluids possess no rigidity whatever; they offer no permanent resistance to change of shape; a fluid takes perfectly the form of the vessel in which it is put, or of any body immersed in it. A solid body, on the other hand, unless it is distorted beyond certain limits, called the *limits of elasticity*, tends to return to its original form, and does so when the distorting stresses are removed. Thus a wire when twisted and let go untwists again, or when stretched or bent and let go it contracts or unbends, except in the case where it is overstrained. Both fluids and solids possess elasticity of volume, and tend to resume their original volume after compression. The elasticity of volume of the former is perfect; whatever compression they have been subjected to, they return precisely to their original volumes at the same temperature when the forces of compression are removed: in the case of solids there are limits to their elasticity of volume as well as to their elasticity of form; thus gold may be made permanently denser by hammering.

There is one law of elasticity, the celebrated law of Hooke—*Ut Tensio sic Vis*, which translated into the modern language of elasticity stands—*Strain is proportional to stress*. *Strain*, according to the suggestion of the late Dr. Rankine, is used by scientific writers to denote any kind of distortion whatever, whether of volume or of form, and *stress* denotes the kind of force or pressure required to produce the strain in question. Hooke's law then asserts that whatever be the nature of the distortion the amount of it is proportional to the stress that produces it. This law is only considered as applicable so long as we do not go beyond the limits of elasticity, that is, so long as we do not apply to the body stresses which permanently distort it. Many bodies, such as the metals, and glass as far as form is concerned, and gases, and probably liquids too as far as volume is concerned, conform to this law with great exactness. See also **BOYLE'S LAW**, **MODULUS OF ELASTICITY**.

ELATER, the name of a family of coleopterous insects, remarkable for a singular apparatus between the thorax and abdomen, by which they are enabled to throw themselves to a considerable height in the air, when placed on their back. The arrangement by which this is effected is so curious, that we cannot suppose it intended solely for this purpose, and deem it most probable that other and more valuable services are rendered to the insect by it. A spine is produced from the thorax, between the first pair of legs, and enters a socket in the post-pectus, or breast. The force and elasticity with which the spine enters its appropriate receptacle, aided by the form of the

thorax, produces a jar or concussion sufficient to throw the insect several inches into the air. This peculiarity has gained some of them the names of springing-beetles, click-beetles, and skip-jacks. When alarmed, the elater draws its limbs close to the body, and falling to the earth quite motionless counterfeits death. Flowers, grass, and decaying wood are the proper habitations of these animals, which are almost always found singly, and not in numbers collected together, as in the case of many other beetles. One species is accused of depredations on the roots of wheat—the *E. striatus* of Fabricius, an inhabitant of Europe. The *Elater noctilucus* of South America possesses luminous properties, which are unlike those of the glow-worm, &c., being seated near the head. Colour dark brown, with an ash-coloured down; thorax on each side with a convex round spot, from which the light is emitted; elytra with lines of impressed punctures. The light emitted by several of these insects, inclosed in a glass vase, is sufficient to read by without much difficulty. As ornaments for the hair and evening dresses of the Spanish ladies, they are said to be in great request, but it is probable that the feeble light which they produce would be entirely eclipsed by the glare of artificial light.

ELATERIN ($C_{20}H_{20}O_8$). If the fruit of the squiring or wild cucumber (*Ecballium officinarum*, or *Momordica Elaterum*) be cut up, the juice expressed, strained, and allowed to stand, a substance deposits which, when collected on a filter and dried, forms very thin, slightly bent, friable cakes, of a greenish-gray colour, with a bitter, acrid taste, a faint odour, and no reaction on test-paper. This is the elaterium of the pharmacopœia, which is employed as a cathartic in dropsical and other affections. If the cakes be exhausted with hot alcohol, the solution evaporated and added to water or to potash, elaterin deposits on cooling, and can be purified by washing and crystallization from alcohol. Elaterin crystallizes in lustrous, colourless, hexagonal tables, insoluble in water, slightly soluble in ether, soluble in alcohol. It fuses at about $392^{\circ} F$. It dissolves in strong nitric acid, and is reprecipitated by water; it is also taken up by sulphuric acid, the solution, which is at first yellow, becoming deep red. It is a very violent purgative, and is poisonous, but its action is not constant, probably from difference in the purity of the drug.

ELBA (anciently, Latin, *Ilva*; Greek, *Aetalia*), a small island in the Mediterranean, in the province of Livorno, Italy, separated from the province of Pisa by the Strait of Piombino, about 6 miles wide. The island is 18 miles in length, and varies in breadth from about $2\frac{1}{2}$ to $10\frac{1}{2}$ miles. The coast is boldly sinuous, and the island is traversed throughout its length by mountains rising to a height of over 3000 feet. It has been renowned for its mines from a period beyond the reach of history. Iron is abundant, and the ore is mined and exported, the workers being partly convicts. Serpentine, granite, marble, and lime are also worked, and salt is obtained from lagoons. The tunny fishery is carried on on the coasts. Excellent wine and fruits are produced. The climate is much milder than that of the adjacent continent. Elba contains two good ports—Porto-Ferraio and Porto-Longone, both defended by fortifications and garrisons. The Treaty of Paris in 1814 erected Elba into a sovereignty for Napoleon, who resided in it from May 4, 1814, to February 26, 1815. Pop. 24,000.

ELBE, THE (ancient, *Albis*; Bohemian, *Labe*), a river of Germany, one of the largest in Europe. It rises on the s.w. slopes of the Schneekoppe or Snow-cap, one of the highest mountains of the Riesen-gebirge, which separates, in part, Bohemia from Sile-

sia, at a height of 4440 feet above sea level; lat. $50^{\circ} 47' N$.; lon. $15^{\circ} 40' E$. From this point it flows nearly due s. into Bohemia through a narrow and wild valley, passing Königgrätz, to lat. $50^{\circ} 3' N$., about 50 miles, when it turns to the w., and having held on that course to lon. $15^{\circ} E$., about 40 miles, takes a general s.w. direction till it falls into the North Sea, in lat. $53^{\circ} 55' N$.; lon. $8^{\circ} 55' E$., intersecting Saxony, a considerable portion of Prussia, and in the latter part of its course separating the duchy of Holstein from Hanover, the former being on the right, and the latter on the left. The entire length of the river, including windings, is upwards of 780 miles; direct distance, about 395 miles. The tract of country through which the river passes has been divided into two well-defined basins, namely the basins of the Upper and Lower Elbe; the former being a plateau surrounded by mountains, and the latter a country entirely of plains, and of twice the extent of the former. The basin of the Upper Elbe, which comprehends nearly the whole of the Kingdom of Bohemia, is a hollow space drained by the streams of the Elbe and the Moldau, and has the two south sides formed by the Forest of Bohemia (Bohmerwald), and by the mountains of Moravia; the two north sides by the Riesen-gebirge and the Erz-gebirge. This basin, which is for the most part ill cultivated and thinly peopled, possesses vast forests, extensive iron mines, and a celebrated breed of horses. The basin of the Lower Elbe is composed almost entirely of plains and of sands, covered with forests, morasses, and small lakes; but slightly fertile, yet well cultivated, well peopled, and having the advantage of extensive communication. The principal affluents of the Elbe are, on the right, the Iser, Schwarz-Elster, and Havel; on the left, the Alder, Moldau, Eger, Mulda, and Saal. In the lower part of its course, namely, between Harburg on its left bank, and Hamburg and Altona on its right, the river is divided into several arms by five large and seven small islands; these arms, however, unite again in a single channel, and the river has here a width of one or two miles; latterly, opposite Cuxhaven, where it enters the sea, it is 10 miles wide. It is navigable for about 500 miles, and in recent years large sums have been spent in improving the navigation both above and below Hamburg, the latter being reached by sea-going vessels. Its estuary is much encumbered with sand-banks. In 1870 the navigation was declared free from Hamburg to Melnik in Bohemia. There is an important system of canal navigation in connection with the Elbe, Hamburg, for instance, being in this way connected with Berlin. The river is well stocked with fish, particularly salmon, eels, and sturgeon.

ELBERFELD, a town of Prussia, in the government of, and 15 miles s. of Düsseldorf, capital of a circle of same name, in the beautiful valley, and on both sides of the Wupper, inclosed by lofty hills. The older part of the town contains a number of good houses, but, on the whole, is poorly as well as irregularly built; the newer part is handsome. Taken in connection with Barmen, which is properly a continuation of it, it stretches along the valley, forming an almost continuous street of 6 miles. It has no historical or antiquarian importance. Its prosperity has been acquired mostly within the present century, and is due to the cotton manufacture, of which it is the central locality in Rhenish Prussia. The most conspicuous buildings are the town-house, which is adorned with numerous frescoes; a handsome church in the Byzantine style; a museum, a gymnasium, with a library and mathematical and physical cabinet, an exchange, a theatre, and an infirmary. In addition to the cotton manufacture, which, under a variety of forms, is the great staple of the town,

linen, woollen, silk, and mixed silk goods, ribbons, and velvets are extensively made, and largely exported. There are also numerous mills for spinning cotton twist, linen yarn, and worsted, and dye-works, celebrated for the richness of their colours. The environs are almost covered with bleaching-grounds. Elbeuf is the seat of a mercantile and other courts, and possesses a chamber of commerce, a harmonic and several other societies. Pop. in 1885, 106,499; with Barmen, 209,587; in 1895, 266,329; in 1900, 298,884.

ELBEUF, an industrial town of France, department Seine-Inférieure, 11 miles s.w. of Rouen, situated in a beautiful valley on the left bank of the Seine. It is handsomely built, and has a town-house, public library, an hospital, &c., and the two Gothic churches, St. Stephen's and St. John's. It has spinning-mills, dye-works, and all accessories for the complete production of woollen manufactures, chiefly of lighter cloths, chequered stuffs, fine coloured flannel fabrics, and all kinds of fancy goods. For these manufactures it is one of the chief centres in France. It is also an entrepôt for the cloths of Louviers and Sedan, which are finer and heavier than those of Elbeuf, and for foreign wools. It communicates by steamers with Paris, Rouen, and Havre. Pop. (1896), with suburbs, 36,763.

ELBING, a seaport town, West Prussia, on the Elbing, near its entrance into the Frische-Haff, 82 miles s.e. of Dantzic. It is divided into the old and new towns, the former of which was once surrounded by turreted walls and gates, but these for the most part have been removed. It has ship-building yards, which do a considerable trade in building and repairing vessels. Its manufactures include cloth, leather, soap, tobacco, beer, &c. By means of a canal it has connection with the Vistula, and the harbour was improved by the opening in 1884 of a mole 3500 yards long. Pop. (1900), 52,510.

ELBURZ, or **ELBRUZ**. See **CAUCASUS**.

ELCHE (ancient, *Allici*), a town of Spain, in the province and 14 miles w.s.w. of Alicante, on the left bank of the Vinalopó; pop. in 1897, 27,975. It is an ancient place, containing various Roman remains; consists in general of wide and well-built streets, and contains among its public edifices a fine church of the Composite order, with a majestic dome, a remarkably fine organ, and numerous statues, pictures, and monuments; a spacious town-house of the fifteenth century, and a feudal castle of the Duke of Arcoas. Elche suffered much during both the Peninsular and the Carlist wars.

ELCHINGEN, a village, Bavaria, on the left bank of the Danube, 9 miles north-east of Ulm, which gave the title of Duke to Marshal Ney, who here defeated the Austrians, 14th October, 1805. In the neighbourhood are the ruins of a Benedictine Abbey of the same name, founded in 1128. There are two villages, Ober and Unter Elchingen, the former on the same hill with the abbey, the latter to the n.e. of it. The hill on which the abbey stood was occupied by Maok, who had his head-quarters in Ulm; while Ney, on the right bank of the river, repaired the bridge of Elchingen, forced the passage of the river, and took Elchingen by storm.

ELDER, a name given to the different species of the genus *Sambucus*. These are small trees or shrubs, with opposite and pinnated leaves, bearing small white flowers, in large and conspicuous corymba. The berries are small, and of a black or red colour. The leaves are bitter and nauseous to the taste, and possess purgative and emetic properties. The bark, flowers, and berries are sometimes used in medicine, particularly in cases of dropsy. The wood of the young shoots contains a very large proportion of pith. The species called *Sambucus nigra*, common in Eng-

land, is a wild shrub, distinguishable by its winged leaves, with serrated and somewhat oval leaflets; its clusters of small white flowers, divided into five principal branches, and the small black berries by which these are succeeded. Two species inhabit North America—*S. Canadensis*, a common plant from the 49th to the 30th parallel of latitude, and found even among the Rocky Mountains, the berries of which are black and have a sweet taste; and *S. pubescens*, which bears red berries, and inhabits Canada, the northern parts of New England, and the Alleghany Mountains. The uses of the elder are more numerous than those of most other plants. There is scarcely any part of it which has not been advantageously employed in some way or other. The wood is yellow, and in old trees becomes so hard that it will receive a polish almost as well as box, and indeed is often used as a substitute for box-wood. Its toughness also is such that it is made into skewers for butchers, tops for fishing-rods, and needles for the weaving of nets. It is likewise employed by turners. Sir J. E. Smith has remarked that this tree is, as it were, a whole magazine of physic to rustic practitioners, and that it is not quite neglected even by professional men. Ointments have been made of the green inner bark, and of the leaves. The dried flowers, infused in water, are used as fomentations or as tea, and mixed with buttermilk, have sometimes been used as a wash for the face. An infusion of the leaves is sometimes sprinkled by gardeners over the buds of such flowers as they wish to preserve from caterpillars. Elder flowers have an agreeable flavour, which they impart in distillation to water; they are likewise used to give a flavour to vinegar. The berries are poisonous to poultry, but their juice, properly fermented, makes a pleasant and wholesome wine; and in Germany a very pure and strong spirit is distilled from them. The juice of elder-berries is sometimes employed to give a red colour to raisin or other sweet wine. The young shoots of this shrub are filled with an exceedingly light pith, which is cut into balls for electrical experiments, and is also made into toys for the amusement of children. The elder will thrive in almost any soil and situation; and every part of it has an unpleasant narcotic smell. The scarlet-berried elder of Southern Europe (*S. racemosa*) is now common in British shrubberies.

ELDERS. We find among many peoples, in the infancy of civilization, that the oldest men, being considered as the most experienced and the least liable to be influenced by passion, administer justice, discuss the welfare of the people, &c. Hence names for high officials in various countries convey the idea of old age, as *senator*, which is connected with *senex*, old; and our own *alderman*. With the ancient Jews the *elders* were persons the most considerable for age, wisdom, and experience. Of this sort were the seventy men whom Moses associated with himself. In the modern Presbyterian churches *elders* are officers who, with the pastors or ministers, are members of the church courts, with authority to supervise and lend their assistance in furthering the spiritual welfare of the congregations. In the higher courts, then delegated thereto, as well as in the lower, the elders are on a like footing with the clergy.

ELDON, JOHN SCOTT, EARL OF, Lord-chancellor of England, was born on 4th June, 1751, at Newcastle-on-Tyne, where his father was a coal-dealer and public-house keeper of means. He was educated with his brother William (afterwards Lord Stowell) at the grammar-school of Newcastle, and at University College, Oxford, where he obtained a fellowship, and in 1771 won the prize for the English essay. In 1772 he made a runaway marriage with Miss Elizabeth Surtees, daughter of a banker in Newcastle,

much to the displeasure of the lady's relations and also of his own, though a reconciliation was at length effected on both sides. His father settled £2000 on him, and he returned with his wife to Oxford to eke out his income by acting as a private tutor, his father-in-law also shortly afterwards settling £2000 on his wife. The year of grace allowed for retaining a fellowship after marriage expired without his obtaining any ecclesiastical living, and thus abandoning all ideas of continuing in the church he resolved to devote himself to the legal profession, and proceeded to London. He was called to the bar in 1776, and at first entertained the notion of settling in Newcastle as a provincial barrister; but this project was soon abandoned, and he continued to push his way as a lawyer in the metropolis. His progress was at first slow, but having greatly distinguished himself in 1780 by a case which he had to conduct before Lord Thurlow his fame and practice rapidly increased, and in 1782 he was made king's counsel. Next year he entered Parliament as member for the borough of Weobley, and supporting the policy of Pitt was made solicitor-general, and knighted in 1788. In 1792 he purchased the estate of Eldon. In 1793 he became attorney-general, and in that capacity conducted the celebrated prosecutions against Horne Tooke and others for high treason. In 1799 he was created chief-justice of the Court of Common Pleas, and was at the same time raised to the peerage and the House of Lords by the title of Baron Eldon. On the accession of the Addington ministry he became lord-chancellor (1801), and retained this post under the subsequent administration of Pitt, whose reinstatement in office he had procured by a series of intrigues which do him little credit. The death of Pitt in 1806 deprived him of the chancellorship; but in the following year, on the demise of the short-lived Grenville cabinet, he resumed it under the premiership of Lord Liverpool. This office he retained for twenty years, and in 1821 was created an earl by George IV. On the accession of the Canning ministry in 1827 he resigned the chancellorship, and never again held office, though he appears to have cherished hopes of doing so till within a few years of his death. He died in London on 8d January, 1838, at the age of eighty-six. As a lawyer Lord Eldon's abilities are universally acknowledged, and no judge that ever sat on the bench was more thoroughly master of all the details of English jurisprudence, or pronounced more accurate and solid deliverances in civil causes. When we consider his character, however, as a statesman our admiration of him becomes materially lessened, both by his political servility and intrigues, and the intolerance with which he determinedly opposed every species of reform, whether in church or state.

EL DORADO, a fabulous country, in which gold and precious stones are as common as rocks or sand in other countries. Francis Orellana, a companion of Pizarro, first spread the account of this fabulous region in Europe; and an Englishman even published at the end of the sixteenth century a description of this favoured country, with a map.

ELEATIC SCHOOL, a Grecian philosophical sect, so called because it originated in Elea (Latin, *Veísa*), a town of Magna Græcia, of which also three of its most celebrated teachers, Parmenides, Zeno, and Leucippus, were natives. The founder of the school was Xenophanes of Colophon, who came to Elea late in life, bringing with him, as Cousin says, the physical theories of the Ionian school, to which he added a metaphysical more conformable to the spirit of his new country. He asserted the unity of God, but he does not appear to have arrived at any settled views as to the mode of explaining the relation of the variety of external nature with the unity to which he attributed

its origin. The essence of the Deity, according to him, consists in ruling. He is neither finite nor infinite, moved nor unmoved. His views have been accused of pantheism, but this seems to have arisen only from their uncertainty and want of development in explaining the relation between unity and variety already referred to. That which from the commencement distinguished the Eleatic school from the Ionic was its method, which in the one case was dialectic, in the other empirical. Starting from the observation of external nature, the Ionians endeavoured to discover some elementary principle, as water, air, fire, or a combination of elements, by the action of which the phenomena they observed might be accounted for. The Eleatics made the abstract idea of Being or God, deduced from the contemplation of the universe as a whole, their starting-point; and their reasonings sometimes led them to deny the reality of external phenomena altogether. This was the result of the development which the principles of Xenophanes received from his followers Parmenides and Zeno, the latter of whom denied the existence of variety in any form, including that of the world and even of movement.

ELECAMPANE (*Inula helenium*), a plant which belongs to the natural order Compositæ. The stem is 3 or 4 feet high, thick, pubescent, and branching above; the radical leaves are often 2 feet and more in length; the flowers are large and yellow; the root is perennial, possesses a bitter, aromatic, and somewhat acrimonious taste, and has been celebrated in disorders of the breast and lungs; it is useful to promote expectoration, and is also sudorific. Two substances have been extracted from the roots, namely, *inulin* and *helenin* (which see).

ELECTION (in English law). See **APPROBATE AND REPROBATE**.

ELECTION (theology). The doctrine, commonly called Calvinistic, that God has from the beginning elected a portion of mankind to eternal life, passing by the remainder. It is founded on the literal sense of certain passages of Scripture, and has been amplified by the labours of systematic theologians into a complete and logical system. It is older than Calvin, and is not exclusively a doctrine of the Reformation, but Calvin has stated it strongly and clearly in his Institutes, and it is generally held as a distinctive doctrine by those who call themselves Calvinists. There are, of course, various ways of defining and explaining the doctrine, and according to the strictness with which it is held, is usually measured the purity of the Calvinism of those who hold it. In this respect it is a test doctrine, and serves to distinguish high from low Calvinists. It is strongly stated in the Westminster Confession of Faith and other standards of the Church of Scotland, and more mildly in the Thirty-nine Articles of the Church of England, Art. xvii.

ELECTION, in politics. The chief forms of election in England to which the term *political* may be applied, are parliamentary and municipal elections. The basis of the suffrage in parliamentary and municipal elections is the payment of poor-rates. Members of Parliament formerly required a property qualification in England and Ireland; but this restriction, which never existed in Scotland, has been abolished. In both parliamentary and municipal elections the ballot has been adopted (in 1872). The adoption of the ballot was designed to prevent undue influence being used at elections, for which purpose it had long been advocated. For the prevention of bribery and corrupt practices many acts have been passed. By the act of 1868 the trial of election petitions was removed from the House of Commons to the Courts of Common Pleas in Westminster and

Dublin, and the Court of Session in Scotland. In England the trial now takes place before two judges of the High Court. By the Ballot Act of 1872 the offences of *treating and undue influence* were defined. The former consists in the candidate or his agent paying for food or drink, &c., in order to influence votes, the latter consists in the use of force or threats, or any violent or fraudulent device to prevent electors from freely exercising their right of independent voting. Persons guilty of these offences are liable to be punished by fine or imprisonment. See also BALLOT, BRIBERY, BRITAIN (section on Parliament). For school-board elections a peculiar mode of voting has been adopted, for an explanation of which see CUMULATIVE VOTE.

ELECTOR (German, *Kurfürst*, electoral prince), the title of certain members of the old German Empire, being powerful princes who had the right of electing the emperors. The number of electors was early fixed at seven, each of whom had some high dignity appertaining to the empire. After various changes they were as follows: 1. The Archbishop of Mainz as Arch-chancellor of the empire; 2, the Archbishop of Cologne as chancellor of Italy; 3, the Archbishop of Trèves as Chancellor of Burgundy; 4, the King of Bohemia as grand cup-bearer; 5, the Count Palatine as grand-steward; 6, the Duke of Saxony as grand-marshal; 7, the Markgrave of Brandenburg as grand-chamberlain. In 1823 the electorship of the Palatinate was conferred on Bavaria, and when it was attempted, in the Peace of Westphalia (1648), to settle the contests in the empire, an eighth electorate was created and given to the Palatinate. In 1692 Hanover was made the ninth electorate. When, in 1777, the house of Bavaria became extinct, and the dukedom fell to the Palatinate, the Bavarian electorship expired likewise. By the Peace of Lunéville, in 1801, the left bank of the Rhine was ceded to France, and the ecclesiastical electors lost their territory. Several changes then took place. In 1802 the Elector of Mainz was declared elector-arch-chancellor, the two other ecclesiastical electors set aside, and Baden, Wurtemberg, Hesse-Cassel, and Salzburg declared electorates; so that there then existed ten electors. In 1806 the emperor abdicated the imperial dignity, and the electors gradually adopted other titles. The electors of Hesse-Cassel retained the title until the incorporation of their territory with Prussia in 1866.

ELECTRICAL FISHES, a name given to fishes that possess the extraordinary property of communicating an electric shock when touched with the hand or an electric conductor. One of the best known of these is the electric eel (*Gymnotus electricus*), which has the body nearly of equal thickness throughout; head and tail obtuse; length, 5 or 6 feet. The seat of the organs which produce this curious effect is along the under side of the tail. They are composed of four bundles of parallel membranaceous laminae, placed very near each other, and nearly horizontally extended from the skin to the central medial plane of the body, connected together by numerous vertical laminae, arranged transversely. The little cells, or rather the small prismatic and transverse canals, intercepted by these two kinds of laminae, are, according to Cuvier, filled with a gelatinous substance; and the whole apparatus is abundantly supplied with nerves. The *Gymnotus electricus*, found in the rivers of South America, is said to possess power, when in full vigour, to knock down a man, and benumb the limb affected, in the most painful manner, for several hours after communicating the shock. By frequent use of this faculty it becomes impaired, and a considerable interval of rest is required to recruit its electrical properties. According to Humboldt the

natives of South America make use of horses in taking the *Gymnotus*. The animals are driven in a body into a stream or pond where the fish abound, and the latter, having exhausted their stores of electricity by repeated attacks upon them, are then easily taken. The horses are sometimes so severely stunned by the shocks that they fall and are drowned. Specimens of the *Gymnotus electricus* are reported to attain the length of 6 or 7 feet, but ordinarily they are about $3\frac{1}{2}$ or 4 feet long. The flesh is eatable and, in appearance and flavour, is said to resemble that of an eel. The torpedo (Pl. ICHTHYOLOGY I, fig. 3), a species of ray found in the Bay of Biscay and in the Mediterranean, is another electrical fish of great power. There are also the *Malapterurus electricus*, found in the Nile; the *Malapterurus Beninensis*, described by Mr. Murray in the Edin. Phil. Journal in 1855; a species of *Silurus*; and others.

ELECTRICALLY CONTROLLED CLOCK. See ELECTRIC CLOCK.

ELECTRIC ARC, a brilliant luminous arc produced when an electric current is passed between two pointed carbon rods placed a short distance apart. The rods are first put in contact so as to allow the current to start. On their being separated slightly the arc is formed, and once formed it serves as a conductor whereby the flow of current is maintained. The temperature of the electric arc is the highest which has been obtained by artificial means. See ELECTRIC LIGHT.

ELECTRIC BATTERY (STATIC) or LEYDEN BATTERY, a collection of Leyden jars so arranged that they may be charged and discharged together. For this purpose all the outside coatings are electrically connected together, and likewise all the inside coatings, as in fig. 8, Pl. ELECTRICITY I. The jars are arranged in a large wooden box A A, which is lined internally with tin-foil; the outside coatings of the jars resting on the tin-foil of the box are thus all connected together. The knobs of the jars are joined together by means of stout brass bars B B, and thus all the inside coatings are also in metallic connection. The brass knob and ring shown in front of the box are connected by means of a thick wire or a broad band of tin-foil with the interior lining of the box, and are used for discharging the battery. It is evident that the battery is practically a simple Leyden jar of great dimensions. It is explained under LEYDEN JAR that the quantity of electricity that a jar can receive from any given source depends both on the extent of the coatings and on the thinness of the glass. The arrangement here described is much more convenient than a single jar of enormous dimensions would be. For it is difficult to procure a glass jar, of the requisite thinness, which would afford such an extent of surface as is here easily obtained; and besides, when powerful charges are employed, there is always considerable risk of perforation of the jar, owing to the strain to which the glass is subjected. If such an accident should occur with one of the jars of the battery all the others will be left unhurt, and the one which has been destroyed may be either replaced or removed altogether. Very remarkable effects may be obtained by means of a good battery. It must always be handled with extreme caution, as a shock from such an arrangement is dangerous, and may even prove fatal. The electric battery was first constructed by Winkler, 1746.

ELECTRIC CALAMINE. See ZINC.

ELECTRIC CLOCK, (1) a clock in which the action of a regularly interrupted current upon an electro-magnet serves as both the motive power and the regulating agent; (2) a clock in which the uncoiling of a steel spring or the action of gravity upon

a weight serves as the motive power, but which is regulated by means of an electric connection with a standard clock.

Of the first-mentioned class one form is that in which an electro-magnet imparts an oscillating motion to a soft iron armature. The motion is in turn communicated to a lever; thence by a ratchet and a series of wheels and pinions the hands are set in motion. The oscillations of the armature, on the rate of which the speed of the hands depends, are regulated by means of a standard clock.

An example of the second class is the form in which the bob of the pendulum consists of a hollow electro-magnet, which in the course of its swing surrounds one or both of two permanent magnets, placed with their axes in the line of swing, and with like poles facing each other. The pendulum of the controlling clock is so mounted that when it arrives at the limit of its path on either side the circuit of the electro-magnet is closed, and as the direction of the current is reversed on the completion of each swing of the controlling pendulum, the polarity of the electro-magnet is also reversed. The direction of the current is such that the action between the two fixed poles in the centre and the nearer end of the bob tends to delay the return of the latter from its extreme position, and as the pendulum is adjusted so as to gain slightly upon the controlling pendulum, the delay, which ceases as soon as the latter commences its return swing, forces the controlled pendulum to become synchronous with the controlling pendulum.

ELECTRIC CONDUCTION. See **RESISTANCE (ELECTRICAL).**

ELECTRIC CURRENT. When electricity is passing along a wire, or along any conductor, solid or liquid, an electric current is said to be flowing along the conductor. For example, we might speak of an electric current flowing from the prime conductor of an electric machine, along a wire connecting the prime conductor and the earth. The term is, however, confined in common language to the currents kept up by a galvanic battery, or by a thermo-electric arrangement, and to induced currents. See **INDUCED CURRENT, INDUCTION COIL, MAGNETO-ELECTRIC MACHINE, THERMO-ELECTRICITY.**

An electric current passing along a conductor possesses certain properties by which it is recognized. To these we refer briefly and generally here, indicating where particulars on each portion of the subject are to be found throughout this work. With regard to the direction of the current we must remark that this is at present purely a matter for conventional definition. The direction of the current is settled by definition, and the flow is considered to take place from a point electrified like glass rubbed with silk to a point electrified like wax rubbed with cat-skin (see **ELECTRICITY**). Thus if a wire connect the prime conductor of an ordinary electric machine with the earth the electricity is defined to flow from the prime conductor to the earth; and if a plate of zinc and a plate of copper be immersed in dilute sulphuric acid and connected by a wire, the current as above defined flows from the copper along the wire to the zinc, and from the zinc plate through the liquid to the copper plate.

The most important perhaps of all the properties of the electric current is its power of acting on the magnetised needle, for it is generally by means of this action that a current is recognized, its direction determined, and its strength measured. When a wire along which a current of electricity is passing is brought near to a magnetised needle the needle tends to take up a position at right angles to the direction of the current. Let such a wire be brought

near to a needle supported so as to turn about a vertical axis, as in the ordinary compass; and let it be held above the needle in the direction of the magnetic north and south line. Under the influence of the current the needle will tend to set east and west; but under the action of the earth's magnetic force it tends to set north and south. It will, therefore, under the influences of these two forces, take up an intermediate position, depending on the ratio between the force of the current action and the directive force of the earth. The direction also of the deflection depends on the direction in which the current is flowing. It is on this property of the current that *galvanometers*, that is, instruments for detecting the existence of a current and measuring its strength, depend.

Again, if a wire covered with insulating material is wrapped round a bar of iron, and a current be sent through the wire, the bar of iron will become a magnet, and will retain its magnetic properties as long as the current continues to flow. Such an arrangement is called an *electro-magnet*. See **ELECTRO-MAGNETISM.**

Another property intimately connected with that just mentioned is the mechanical force exerted by currents on currents. If two wires have each of them a current flowing along it, the wires attract each other if the currents are flowing in similar directions, that is to say, towards the same parts, though perhaps not parallel, and if in dissimilar directions they repel each other. See **ELECTRO-DYNAMICS.**

A current of electricity passing along a wire meets with resistance, which has been compared to that which water forced through a tube filled with sponge would experience. When the current is caused to pass round a galvanometer the deflections of that instrument indicate the strength of the current, and it is found that when a considerable length of wire is introduced into the circuit the current is diminished. The resistance to the current is greater the greater the length of the wire and the smaller its cross-section. It also varies with the material of the wire, silver and copper wires having least resistance, and wires of iron, lead, and platinum offering very great resistance. (See **RESISTANCE—ELECTRICAL**.) A current passing along a wire which offers much resistance to its passage gives rise to very considerable heat. Thus a fine platinum wire is heated to redness, whiteness, or even to fusion by the current. The amount of the heating effect at any part of the circuit depends on the resistance at that part, and is simply proportional to it. It also depends upon the square of the strength of the current. (See **HEAT OF THE ELECTRIC CURRENT**.) The electric light, except in 'incandescent' lamps, is chiefly due to the intense heating of the air and particles of carbon in the short space that separates the carbon points.

The chemical effects of the electric current on a compound liquid capable of transmitting it are described in detail under **ELECTROLYSIS**. The passage of the current is attended by chemical decomposition of the conducting liquid. Thus when two platinum wires or plates connected with the wires that come from a battery are dipped into a solution of chloride of sodium (common salt), the sodium is liberated at the plate which is connected with the zinc, or negative, end of the battery, while chlorine is liberated at the other plate. (See also **GROTHIUS' HYPOTHESIS**.) The amount of decomposition that goes on in a given time is proportional to the strength of the current; and if the same current passes through several electrolytes in succession, the quantities of the electrolytes decomposed are proportional to the chemical equivalents of the bodies.

The physiological effects of electricity are very re-

muscles. An electric shock produces a violent disturbance of the muscles. It was by means of the muscular contractions exhibited by the limbs of the frog under electric excitement that current electricity was discovered by Galvani. The subject has been examined since his time by Faraday, Matteucci, the Becquerels, Dubois Raymond, Dr. Raddcliffe, and others, and very recently remarkable additions have been made to our knowledge of it, and of the effect of electricity on the muscular action of animals, by Professor Ferrier. Death by lightning is simply death caused by an electric shock.

One of the most important sources of the electric current is *chemical action*. When two metallic plates are immersed in a liquid which acts more powerfully on one than on the other—for example, when a plate of zinc and a plate of copper are immersed in dilute sulphuric acid—and are connected by a wire or other conductor, a current is set up between them. Faraday showed, by carefully devised experiments, that the conducting wire appears to be in the same condition under these circumstances as a wire led from the prime conductor of an electric machine to the earth while the machine is being worked.

Another source of electric currents is *heat*, applied to junctions of dissimilar metals. When a complete circuit is formed of two metals, for example, when the ends of a copper wire are soldered to the ends of an iron wire, and when one of the junctions is raised to a higher temperature than the other, a current is set up and maintained so long as the difference of temperature is kept up. Heat disappears while the action is going on, and the current, capable of doing work, by means of an electro-magnetic engine, or of producing chemical effects, in the way of electrolysis, is the result.

Induction is another source of electric currents, and is by far the most important of all. The reader will find information on this subject under **INDUCTION, INDUCED CURRENTS, and MAGNETO-ELECTRIC MACHINES**.

Recent researches in electrical science have led to the following conclusions regarding the nature of a current of electricity passing along a wire: (1) that electricity may be said to travel from one end of the wire to the other, although in the present condition of scientific knowledge it is impossible to define accurately what is meant by the travelling of electricity in this sense; (2) that the transmission of electrical energy, as distinguished from electricity, takes place mainly, and in the hypothetical case of a perfectly conducting wire, entirely, by means of the non-conducting medium surrounding the wire. The wire simply dissipates the energy which it receives laterally from the surrounding medium, and thereby prevents the latter from assuming a static state of strain, a condition in which the further transmission of energy would be impossible. Thus, as Lodge points out, the energy of a dynamo does not travel to a distant motor through the wires, but through the air; nor does the energy of a cable battery travel through the wire strands, but through the insulating sheath.

ELECTRIC DISTRIBUTION. See **ELECTRO-STATICS**.

ELECTRIC EGG. See **VACUUM TUBE**.

ELECTRICITY, from the Greek *Elektron* (amber), the name applied originally to the unknown cause of the attraction, repulsions, sparkings, &c., which attend the friction of amber and similar substances. The same cause is now recognised as giving rise, under various circumstances, to many phenomena which may be grouped under these heads: (1) Electricity at rest, to be chiefly treated in this article; (2) Electricity in motion (see **ELECTRIC CURRENT**), and

(3) Electricity in rotation (see **ELECTRO-MAGNETISM**). The knowledge which the ancients possessed concerning this science consisted in little more than the fact that amber acquires the power of attracting to itself light bodies on being rubbed, ascribed by Thales of Miletus to an inherent soul or essence, which, awakened by friction, went forth, and brought back the light particles floating around. In the year 1600 Dr. Gilbert, an English physician, published a treatise, *De Magnete*, in which he dealt with the attractions and repulsions due to magnetism and electricity, and remarked that several other bodies besides amber can by friction be made to attract light bodies. The observations of Boyle, Otto von Guericke, Newton, and a few other philosophers of the same period contributed somewhat to the extension of our knowledge of electricity; but it was during the eighteenth century that the most important discoveries and generalizations of the phenomena before known upon this subject were made.

Hawkesbee made several very important discoveries, and among other improvements he introduced the glass globe for producing electrification. (See **ELECTRIC MACHINE**.) Stephen Grey about the year 1729 made numerous experiments with glass tubes and other apparatus, which led to the important discovery that some bodies are conductors, and others non-conductors of electricity; and along with his friend W. Wheeler he discovered the method of insulating bodies. M. Du Fay soon afterwards inferred the distinction of vitreous and resinous electrification from having observed the difference of effects arising from exciting a body of a resinous nature compared with bodies of a glassy nature. To the same philosopher is due the merit of introducing the metallic conductor in the electric machine. Von Kleist and Muschenbroek simultaneously discovered the jar or Leyden phial, and Dr. Franklin or Winkler combined these jars in the form of what is called the electric battery. Franklin, by experimenting on the Leyden jar, was led to the conclusion that while the one side of the jar (when charged) possessed a greater quantity of electricity than its natural share the other side had lost a quantity, and that thus while the one side had electricity in excess the other had it in defect. The distinction which Du Fay had made between vitreous and resinous electricity, regarding them as different fluids, was by Dr. Franklin accounted for on the principle that one class of bodies were surcharged, and therefore gave out electricity, others were undercharged, and were disposed to receive it; the first class he called positive, corresponding to the vitreous class of Du Fay, and the others he termed negative, the same as the resinous of the French philosopher. Dr. Franklin was the first who brought down electricity from the clouds, by means of a kite, and he introduced the conducting-rod for preserving buildings from the action of lightning.

In this article we propose to give a general statement of the main facts of the science with special reference to frictional electricity, and to indicate where special information on its other branches may be found.

If a dry glass rod be rubbed with a silk handkerchief, or a piece of amber or sealing-wax with a woollen cloth, and be presented to light bodies such as fragments of paper, thread, cork, light straw, or little bits of gold-leaf, the light bodies are first attracted, but immediately after contact with the glass or sealing-wax they are again repelled. The experiment is better shown by means of a light gilded ball of elder pith suspended by a fine silk fibre. When the glass rod or the sealing-wax is brought near, the little ball is at once attracted to

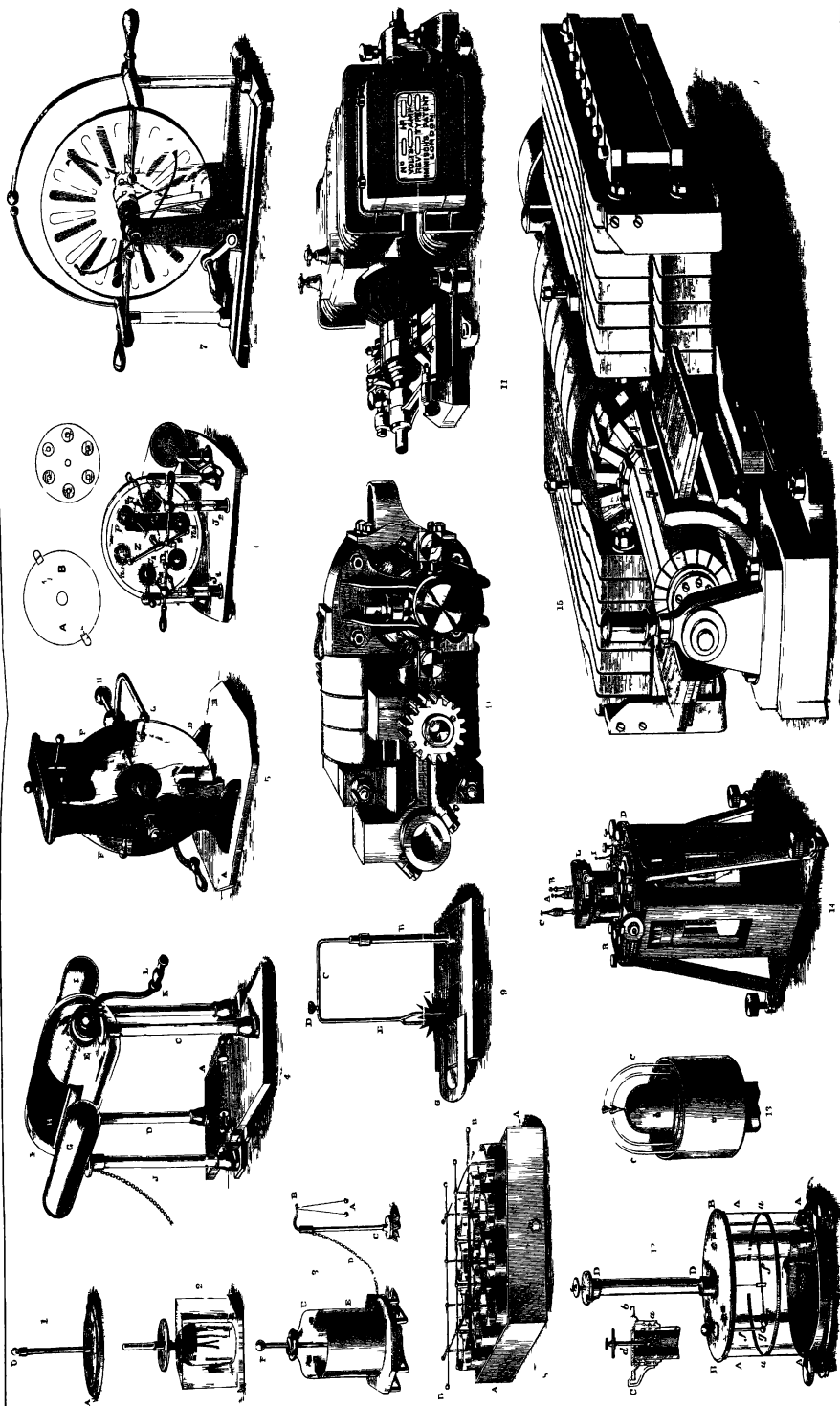


Fig. 1. Helicograph. 2. Conducing the telescope. 3. Sprague's Motor. 4. Cylindrical Frictionless Machine. 5. Tesla's Motor. 6. Tesla's Motor. 7. Tesla's Motor. 8. Tesla's Motor. 9. Tesla's Motor. 10. Tesla's Motor. 11. Tesla's Motor. 12. Tesla's Motor. 13. Tesla's Motor. 14. Tesla's Motor. 15. Tesla's Motor. 16. Tesla's Motor.

Fig. 1. Helicograph. 2. Conducing the telescope. 3. Sprague's Motor. 4. Cylindrical Frictionless Machine. 5. Tesla's Motor. 6. Tesla's Motor. 7. Tesla's Motor. 8. Tesla's Motor. 9. Tesla's Motor. 10. Tesla's Motor. 11. Tesla's Motor. 12. Tesla's Motor. 13. Tesla's Motor. 14. Tesla's Motor. 15. Tesla's Motor. 16. Tesla's Motor.

attracted, but on contact with either of them it is immediately driven away from it: and it remains, often for a long time, repulsive of the body that has touched it. It has thus, evidently, received a new power or property by coming in contact with the glass or wax. Let us suppose that the suspended ball has been touched with the glass rod, and has thus become repulsive of it: if we now bring near the sealing-wax, we find that instead of being repelled, it is attracted. The same is true of a ball that has been touched with the sealing-wax, and thus rendered repulsive of it. It is attracted by the glass. Lastly, if a second ball is brought near to the first, one having been in contact with the wax, and the other with the glass, they attract each other; but if they have both been in contact with the wax, or both with the glass, they repel each other.

These are the most elementary facts: and even from these alone some very important information is obtained. In the first place, friction of glass with silk, and of sealing-wax with a woollen cloth, confers on these bodies new properties. They become *excited* or *electrified*. They have also the power of communicating their electrification to other bodies, and, again, a body electrified by either of them can electrify a third. There are two kinds of electrification, one, that belonging to glass, which is thence sometimes called *vitreous*; and the other, that of wax, thence termed *resinous*. The last experiment shows that an electrified body communicates to another in contact with it electrification of the *same sort as it possesses itself*: and hence from this experiment, in connection with those that preceded it, we learn that *similarly electrified bodies repel each other, and dissimilarly electrified bodies attract each other*. Finally, we observe that neutral bodies are attracted by those which are electrified.

Bodies were divided by the first cultivators of the science into *electrics*, which can be excited by friction; and *non-electrics*, which cannot be excited in this way. The earliest experiments were all directed to the placing of bodies in these two groups, till the discovery of *electric conduction* by Stephen Grey, which broke down the distinction, and at the same time gave rise to experimenting and to progress in a more profitable direction. Stephen Grey found that some substances have the power of transmitting electricity from one place to another, while others are destitute of the property, or at least appear so to ordinary methods of experimenting. He allowed a long wire to hang down from an upper room through a hole in the floor and ceiling to the floor of the room below, and at the top he supported the wire with fine silk threads. Electrifying a rod of glass by friction, he brought it to the upper end of the wire, while a friend below watched the result, with the assistance of pith-balls suspended as described above, and they obtained all the phenomena we have just described at the lower end of the wire. It was plain from this that the wire was able to carry or conduct the electricity, but that the silk threads by which it was supported were not able to do so; and soon *conductors* and *non-conductors* were clearly recognized. Du Fay pointed out that all electrics are non conductors, and all non-electrics are conductors. It then became evident that the reason why the so-called non-electrics had not exhibited the effects of frictional excitation, was that the electricity was conducted away as fast as it was produced; and soon after it was shown that a metallic rod supported by a glass handle, *insulated*, as it is termed, can be electrified by striking it lightly with a dry cloth.

Theories began to be started about the time of the discoveries just now alluded to. That of Du Fay and Symmer, and other hypotheses to account for

the phenomena observed, began to be discussed. It had been proved that all bodies are capable of electrification, and it became necessary to examine both the body used as a rubber, usually some kind of fabric or cloth, and the body rubbed, usually some solid body. It was found that both bodies are electrified in every case, the one like glass rubbed with silk, and the other like wax rubbed with woollen cloth. Du Fay and Symmer thence assumed the existence of two electric fluids, which they called *vitreous* and *resinous*. They supposed these to exist in equal quantities in all neutral bodies, and that when two bodies are rubbed one on the other, the fluids are separated: one of the bodies becomes over-charged with one of the fluids, and the other with the other fluid, the nature of the bodies determining which shall receive the excess of the vitreous and which the excess of the resinous fluid. They assumed that each of these fluids repels other portions of itself: so that when a rod of glass has communicated some of its excess of vitreous electricity to a pith-ball, the glass rod and the ball become repulsive of each other, on account of the electricity they possess. The two electric fluids were, on the other hand, supposed to attract each other: thence a resinously electrified stick of sealing-wax brought near to a pith-ball which has been electrified by contact with an electrified glass rod, attracts it. The holders of this theory therefore took it for granted that when two bodies are rubbed together, the rubber and the body rubbed receive equal charges of opposite kinds of electricity. This we now know from Faraday's experiments to be strictly true, though we no longer hold the *double fluid hypothesis*, as that of Du Fay and Symmer is called. Franklin's theory of a single fluid will be stated immediately.

The next step was to arrange substances in order as follows: where each substance in the list becomes electrified vitreously if rubbed with any of those that follow, and resinously if rubbed with any of those that precede it:—

Cat-skin.	Glass.
Flannel.	Cotton.
Ivory.	Silk.
Rock-crystal.	The hand.
Wood.	Sulphur.
Shell-lac.	Caoutchouc.
Resin.	Gutta serena.
Metals.	Gun-cotton.

The order of such a list as this cannot, however, be considered absolute. Much depends on the state of the surfaces, on the temperature of the bodies, and so on. Thus if two rods or plates of the *same* glass, one of which is smooth and the other of which has had its surface roughened, are rubbed together, the rougher rod or plate is electrified like sealing-wax rubbed with woollen cloth; and when a white and a black silk ribbon are drawn one over the other, the black one generally becomes resinously and the white one vitreously electrified.

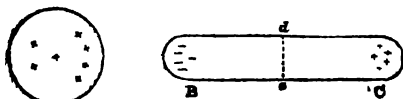
Instead of the theory above alluded to, Franklin held that there is one electric fluid, which possesses an affinity or attraction for various substances in various degrees. In its natural condition every body is associated with a certain quantity of this fluid. Friction of two dissimilar bodies together causes some of the fluid to leave one of them and pass to the other. Thus one becomes over-charged, or *positively* charged; and the other under-charged, or *negatively* charged. He considered a body electrified like glass to possess an over-charge; and thus positively electrified bodies are the same as vitreously electrified bodies, and negative electrification corresponds to resinous electrification. Franklin, to account for the attractions and repulsions exhibited

by electrified bodies, assumed that the electric fluid repels itself and attracts matter, and that on this account two positively electrified bodies repel each other. In order to reconcile his theory with facts it is further necessary to assume that two portions of matter deprived of all electricity repel each other, and this addition to Franklin's theory was made by *Æpinus*. Franklin's terms *positive* and *negative* are still employed: it is plain, however, that this may be done without reference to any theory whatever.

The conducting powers of different substances vary greatly. Between glass and sealing-wax, which, to rough experiments, do not appear to conduct at all, and the metals, which at first sight seem to offer no resistance whatever to the passage of electricity, there are various grades. Thus bodies have been distinguished into groups as follows:—*Conductors*: metals, graphite, solutions of salts and acids, pure water. *Semi-conductors*: alcohol, ether, dry wood, stone, paper (moist), ice at 0° C. *Non-conductors*: dry metallic oxides, fatty oils, ice at -25° C., phosphorus, dry paper, &c., wool, silk, gems, glass, wax, sulphur, resin, amber, gutta-serena, caoutchouc, shell-lac, ebonite, paraffin, water vapour (*i.e.* dry steam), gases.

Such an arrangement as this is made in connection with the part of the subject now before us, namely frictional electricity; but when we are concerned with the voltaic current we not only distinguish with great exactness between conductors, semi-conductors, and non-conductors, but we determine the minutest differences between the various so-called perfect conductors and perfect non-conductors, and we find that all conductors offer some resistance to the passage of the current, and that no body is altogether destitute of the power of conducting electricity. See **RESISTANCE (ELECTRICAL)**.

Electrostatic Induction is the next point to which we briefly refer in this place. The accidental discovery of the Leyden jar (see **LEYDEN JAR**) led to the knowledge of induction. When an electrified body is brought near to a non-electrified conductor, electrical disturbance takes place at the surface of the latter. Electrification of the opposite kind to that possessed by the electrified body is manifested at the side nearest to it, and the opposite kind at the remote side. This may be beautifully shown by the following experiment:—



Let a body A, electrified positively, be brought near to B C, a long-shaped conductor which is divided into two parts at d, but which, when B and C are put together in close contact, form one complete conductor. By the application of tests, for example by means of the electroscope, it may easily be shown that B, the end nearest to the electrified body A, is negatively electrified, while C is electrified positively. When A is carried away the negative electricity in B and the positive electricity in C reunite, and B C is found to be again in a perfectly neutral and undisturbed condition. But if, while A is in the neighbourhood of the conductor B C, the two parts B and C are separated, they are found to retain their electrification. To this phenomenon of electric excitement, produced in a conductor by the presence without actual contact of an electrified body, the name *electrostatic induction* is given. The term *electrostatic* is added to distinguish this species of

induction from *current induction*, a phenomenon altogether distinct from that with which we are now concerned. (See **INDUCED CURRENT**, &c.) Electrostatic induction plays an important part in electrical phenomena. No accumulation of electricity can ever exist without the manifestation of induction. Thus if a conductor be insulated and electrified, and placed in a closed space, a room for example, induction is instantly called into play between the conductor and the walls that inclose it. Precisely as much electrification of the opposite sort is attracted to the surrounding surfaces as is possessed by the electrified body. If there be no walls the influence extends out to the earth, the clouds, or whatever surfaces may present themselves, and we have no reason to suppose that distance interferes with the action; the rate of its propagation is very great. It precedes and is essential to electrical discharge. Thus, when discharge is about to take place, induction is called into play intensely in a particular direction. When a thunder-cloud charged negatively passes over a building, the whole surface of the building becomes electrified positively. If it be furnished with a lightning-conductor, the electricity may be heard and seen streaming from the point to the clouds, which are thus slowly and quietly discharged. The use of the conductor is to concentrate the inductive influence chiefly on itself, which it does on account of its shape. (See **ELECTROSTATICS**, for the distribution of electricity.) Many of our most important electrical instruments also are founded on electrostatic induction. The capacity of condensers of various kinds depends on it. See **LEYDEN JAR**, **ELECTROPHORUS**, **INDUCTION (ELECTROSTATIC)**, and **CAPACITY (SPECIFIC INDUCTIVE)**.

The properties of electricity in motion are of extreme importance. They are described in the preceding article, **ELECTRIC CURRENT**.

Besides friction, there are various other causes of electrification. One of the most important of these is the contact of metals. When a plate of copper and a plate of zinc are put in contact, and then separated by means of insulating handles, the zinc is found to be positively electrified and the copper negatively. The same is true of any pair of metals, and even of two plates of the same metal whose surfaces have been differently treated. The cause of the electrification produced when two pieces of different metals, say copper and zinc, are put into contact, is a question which has given rise to much difference of opinion. On the view that every atom has a definite charge of electricity associated with it, the phenomena observed can be accounted for by the fact that zinc possesses a greater affinity for oxygen than copper. So long as the plates are merely surrounded by air, there is no manifestation of electrification, for in spite of the affinity of oxygen for zinc the atoms of oxygen, which everywhere surround the zinc, cannot move up and give it a charge without a corresponding opposite charge being imparted elsewhere. When the two plates are put in contact some of the oxygen atoms are removed, and the zinc is thus in a condition to receive a charge from other oxygen atoms in contact with it, while a path for the corresponding opposite charge is provided across the junction of the metals. A similar effect is produced in the case of the copper, but in a less degree, and therefore on the whole, the zinc and copper are at different potentials. Apart from this so-called contact force a true contact force exists at the junction of two metals, and though generally of small value, it plays an important part in the reversible heating effects which are produced when a current of electricity is

ELECTRICITY.—II.

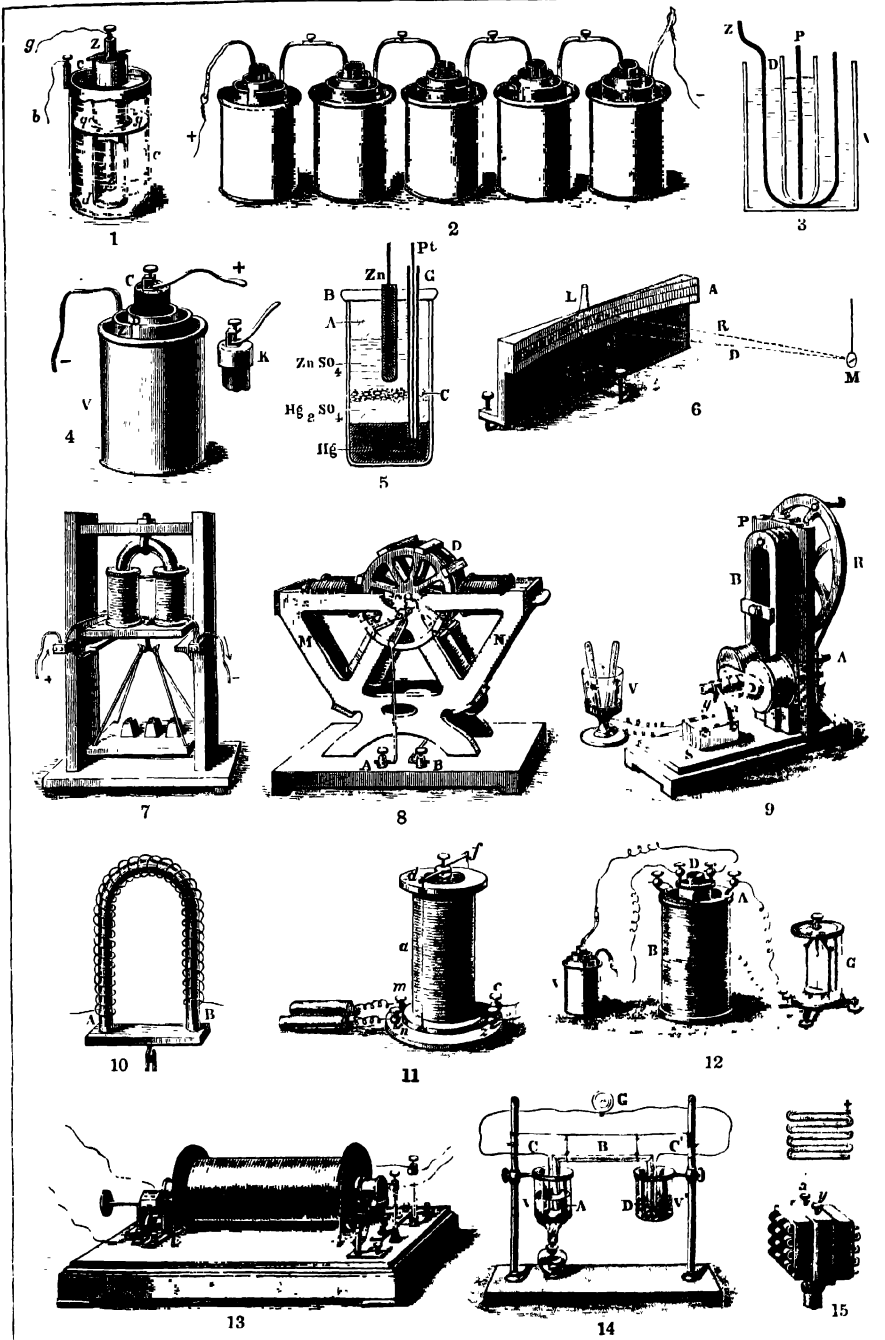


Fig. 1. Daniell's Cell. 2. Cells joined in Series. 3. Grove's Cell. 4. Bunsen's Cell. 5. Clark's Standard Cell. 6. Galvanometer Needle and scale. 7. Electromagnet. 8. Form of Motor. 9. Hand-dynamo joined up to produce Electrolysis. 10. Simple form of Electromagnet. 11. Simple form of Induction Coil. 12. Battery and Coil joined up with Galvanometer. 13. Thermoelectric Couple. 14. Thermopile. 15. Thermopile.

passed in opposite directions through the junction. See **VOLTAIC PILE**.

It appears that whenever two, ~~similar~~ substances, or even two bodies whose substances are the same, but whose surfaces have some difference, are put in contact and then separated, electric disturbance takes place. Thus if a disk of cork and a disk of caoutchouc are pressed together and then separated, the former is found electrified positively and the latter negatively. If a body whose surface is smooth and polished be pressed on a second body of the same kind whose surface is roughened, electrification may often be shown on separation; and the same is said to be the case when two bodies of the same material, but one of them hot and the other cold, are pressed together. After cleavage many laminated minerals, such as mica, calcareous spar, &c., exhibit strong electrification at the surfaces of cleavage; when these surfaces are discharged they may be electrified again by pressing them together and separating them.

Change of temperature produces electric excitement in some minerals. Tourmaline, and others, when heated in a flame, exhibit strong electrification at the two ends of the principal axis as long as heating is going on. One end of the crystal is positive and the other negative. When removed from the flame polarity is again exhibited during cooling, but of the opposite kind, the end that was positive during heating being now negative. The name *pyro-electricity* is given to phenomena of this kind. Lastly, we mention *thermo-electricity*, referring our readers, however, to our article under that name, and to **THERMOPILE**, for full information on this important subject. When a complete circuit is formed by soldering two different metals together, for example, one end of a copper wire to one end of an iron wire, and likewise the other ends of the wires, and when one of the junctions is maintained at a higher temperature than the other, a current is kept up. The direction of the current and the electro-motive force in the circuit depend on the metals employed, and on the temperatures of the two junctions.

Many attempts have been made to ascertain the true nature of electricity, but while progress in the right direction has certainly been made, it cannot be said that we have yet any sure knowledge of what this subtle agent really is. Electricity certainly *behaves* as if it were an incompressible fluid substance, but it differs from all known fluids in so many particulars that it may with certainty be asserted that whatever else it may be, it is not a fluid in the ordinary sense of the word. Neither is it a form of energy, although electrification, as distinguished from electricity, certainly is such. Many scientific men, competent to express an opinion, hold the view that electricity is the ether itself (that is, the elastic, incompressible medium pervading all space and conveying luminous and certain other vibrations), and that the phenomena of positive and negative electrification are due to displacement of the ether at the surfaces of bodies. The researches of Hertz, who, by direct experiment, verified Clerk Maxwell's brilliant theory that electrical action is propagated through space by wave motion in the ether, differing only in respect of wave length and period from the vibrations which constitute light, have been of the utmost value in helping to arrive at a solution of this most difficult question. Investigations into the phenomena of electric discharges in high vacua, followed by the discovery by Röntgen of the remarkable properties of the so-called X-rays, have also thrown great light on the subject.

The applications of electricity are extremely

varied; and as our knowledge of the subject has increased they have rapidly become more important. Its employment for telegraphy and electro-metallurgy, for chemical and for medical and physiological purposes, for the production of light to illuminate streets and buildings, for railways, vehicles and machinery of various kinds, are all mentioned as examples.

ELECTRICITY, DISSIPATION OF. The gradual loss of electricity from a charged body surrounded by non-conductors, which takes place by means of them, is called *dissipation of the electric charge*. A charged conductor, for instance, supported on a glass pillar, slowly loses its electricity. This is due partly to the creeping of the electricity along the surface of the glass, which, even if it be as free from dust and dirt as we can make it, is never absolutely free from an invisible film of moisture; and partly to the air that surrounds the conductor, the particles of air becoming charged and flying off carrying electricity with them. In performing delicate experiments, such as those of Coulomb for determining the laws of the distribution of electricity on conductors, this gradual loss must not be neglected; and accordingly Coulomb made a careful investigation into the laws of dissipation, by which he was able to allow for it in cases where he could not arrange his experiments so as to be undisturbed by it. Coulomb was led by his experiments to abandon the use of glass as a support for his conductors whenever it was possible, employing instead thin stems of shell-lac, and sometimes suspending small electrified bodies by well-dried silk fibres. He found that the amount of loss in a given time by means of the particles of air diminishes as the charge possessed by the conductor gets weaker and weaker, the losses in successive equal intervals of time being in geometrical progression.

ELECTRICITY, VELOCITY OF. See **VELOCITY OF ELECTRICITY**.

ELECTRIC LIGHT. There are various ways in which electricity may produce light: the sparks, for instance, due to the discharge of electrostatic accumulations, give an intense light, of which lightning flashes are the most magnificent example; the silent discharge of the induction-coil through a partial vacuum gives lights of extraordinary beauty (see **VACUUM TUBES**); light may also be obtained by keeping a platinum wire at a white-heat by the passage of an electric current. The name electric light was, however, first generally applied to the light obtained when a powerful battery or dynamo machine is connected with two carbon terminals, which are then drawn a small distance apart. It may be roughly shown by simply connecting two pieces of the very hard compact carbon that is found in the heads of gas-retorts to the electrodes coming from a powerful battery, and with the hands alternately bringing the carbons in contact and separating them again. Flashes of extraordinary brightness may thus be obtained. The experiment may also be performed under water.

If the two carbon terminals are brought into contact, and if they are then cautiously separated to a very slight distance, the current may be made to pass continuously between them. It appears to be conducted across the short interval by the stratum of intensely heated air mixed with heated particles of carbon. During the passage of the current there is a transference of carbon from the positive terminal to the negative terminal. Both carbons waste away, but the former at double the rate of the latter. On examining the two, also, with the help of dark glasses, or by throwing an enlarged image of them on a screen, the positive pole has a hollowed-out

appearance, owing to its particles being carried off; and the other, which is receiving particles, has an appearance of being heaped up. Owing to the wasting of the points, and to the necessity of keeping them at as nearly as possible a fixed distance from each other, an arrangement for making them approach each other gradually must be used in order to obtain a permanent light. To keep the light always in the same position, also, the positive point must be moved forward at double the rate of the other. The contrivances for this purpose are called *regulators*. The electric light is much employed for domestic and such like purposes in the 'incandescent' form. A glass bulb is very completely exhausted of air and the current passed along a specially-prepared carbonized thread in the interior of the hermetically-sealed bulb. The heat developed in the thread raises it to a state of incandescence in which it becomes highly luminous. The light is much less dazzling than the arc light, and in every way better suited for ordinary use. See next article.

ELECTRIC LIGHTING. The brilliant and dazzling light obtained by transmitting a powerful electric current between two sticks of carbon (see above article) was first discovered by Sir Humphry Davy, who exhibited it in 1818 at the Royal Institution, employing for the purpose a voltaic battery of 2000 cells. Renewed attention was called to the subject in 1846 and following years, when some efficient regulators were invented for keeping the carbons at a nearly constant distance during their gradual consumption, the best-known name in England in this connection being that of W. E. Staite, a young engineer, who gave numerous exhibitions of the light in various towns of England; while in France, Foucault and Duboscq, instrument-makers in Paris, carried the construction of regulators, by successive improvements, to a very high degree of efficiency. The light was used in 1846 at the Paris opera-house to aid in the scenic effects of the opera *Le Prophète*, and it was introduced into lighthouses in 1858, being first exhibited at the South Foreland lighthouse in December of that year.

One of the chief obstacles to the earlier introduction of the light was the cost and trouble of maintaining a sufficiently strong current by means of a voltaic battery. Faraday's discovery of magneto-electric induction furnished a new source of electricity, and machines founded on this principle were successively improved until a large pattern, commenced by Nollet in 1850, was so far improved by Holmes in 1853 and following years, as to be adopted by the Trinity Board in 1857 for lighthouse purposes. Modern dynamos consist essentially of two principal parts, viz. the electro-magnet or -magnets, usually fixed, and the armature which revolves. The electro-magnet when excited by the current through its coils creates a magnetic field of intense power. The armature, a coil or collection of coils mounted on a spindle, is revolved in this magnetic field. Powerful currents of electricity are thus obtained, which are collected and directed by various devices. See MAGNETO-ELECTRIC MACHINES, DYNAMO-ELECTRIC MACHINES.

Some of the machines now employed for supplying currents for the electric light are shown in the accompanying plate.

Such machines belong to one or the other of two classes, *continuous-current* machines and *alternating-current* machines. In all of them the currents are generated by causing coils of insulated wire (usually with soft-iron cores) to move in a strong magnetic field. This field, or region of intense magnetic force, is produced sometimes by perma-

nent steel magnets (which was the original plan), but more usually by electro-magnets, which are much less bulky in proportion to their power. In either case they are called the field-magnets, and the coils which move past them are called the armature-coils. In continuous-current machines the current which they send through the external circuit is always in the same direction. Machines of the other class produce currents whose direction is alternately in one direction and the opposite, the reversals succeeding each other usually some hundreds or thousands of times in a second. The two collecting springs rub without interruption on the surface of two revolving cylinders, to which the ends of the armature-coil or of its several sections are connected. The field-magnets of an alternating-current machine, if they are electro-magnets, must be excited by a current distinct from that of the machine itself, as alternating currents will not serve for this purpose.

Alternating-current machines are divided into two groups: machines in which the armatures are fixed while the magnets revolve, and machines in which the magnets are fixed and the armature revolves. All continuous-current machines have armatures with iron cores ring-wound or drum-wound according as the conductors pass through an interior opening or lie on the exterior surface of the core only. In fig. 2, which represents a general view of the Ferranti dynamo, the chief peculiarity is that the armature is not made up of coils, but consists of zigzags of strip copper folded upon one another. It is a very perfect and powerful machine, one 4 feet in diameter running at about 450 revolutions a minute, being capable of supplying 3000 lamps of 8-candle power. An important feature in the Ferranti machine is the facility with which it can be taken apart for the examination of the armature. The magnets are divided laterally into two sections, so that each half of the dynamo can be drawn back on a sliding-plate by means of racks and levers, and thus admit of the armature being exposed for examination. In the distribution of the current an instrument called a 'transformer' (fig. 5) comes into use. It is fitted up in the buildings where the light is introduced, and its function is to convert the comparatively small current of electricity carried to it by the service wires at high pressure into a large quantity at low pressure for use at the lamps. Fig. 3 is a continuous-current dynamo with one magnetic circuit, the armature being at the top. Where weight is no objection this form of dynamo is economical, as less wire is required to excite the field-magnets than in a double magnet. The position of the armature also enables it to utilize more of the lines of magnetic force than in the older type. The Edison-Hopkinson dynamo (fig. 7) is a modern development of the Edison machine due to Dr. J. Hopkinson. In Edison's machine the magnets consisted of a number of separated cores connected to one common pole-piece. A great improvement has been effected in substituting for these multiple-cores one heavy core of large section and of much shorter length, by means of which the cross-section of iron which could be employed for an armature of given length was greatly increased, while at the same time a great reduction in the length of wire required for excitement was attained. In the Edison machine the iron discs of which the armature core is built up were held together by uninsulated bolts passing through all the plates, thus causing a heavy loss by the generation of eddy currents. In the improved machine these bolts are omitted and the

ELECTRIC LIGHT

Fig 1

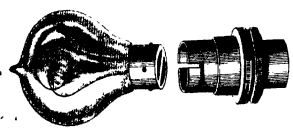


Fig 2

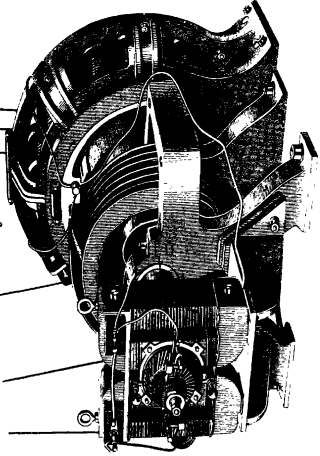


Fig 5



Fig 6

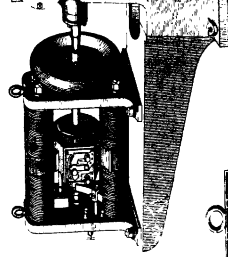


Fig 9

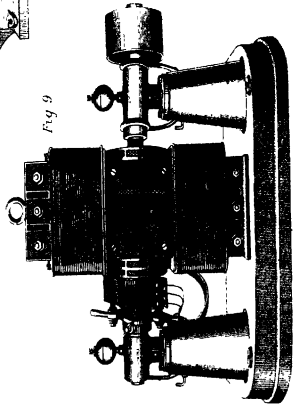


Fig 8

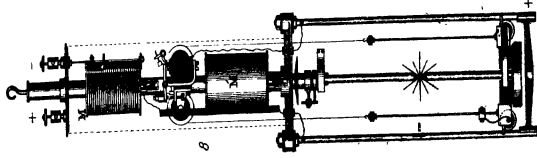


Fig 3

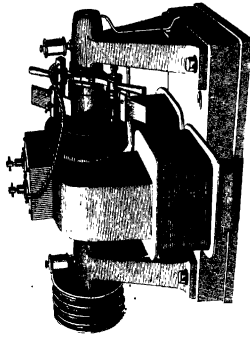


Fig 10

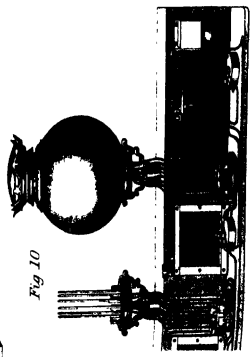


Fig 11

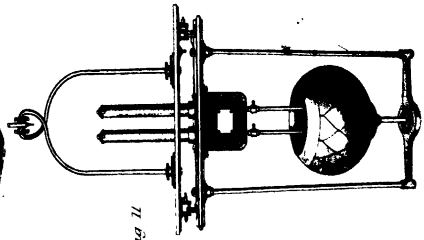


Fig 7

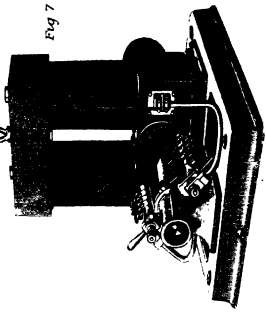
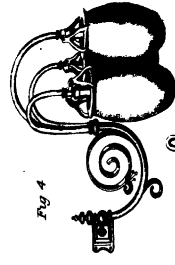


Fig 4



plates are held together by nuts screwed on to the spindle itself, which thus serves for a bolt. The armature section has been increased along with the increase in the section of the magnets. The area of the armature core is rather more than 8 of the cross section of the magnets. The armature consists of a large number of charcoal iron discs separated by sheets of thin paper. It is wound round with a conductor of parallel wires. The collector has a number of bars of drawn copper insulated with mica, the connections to the coils being made by gold-plated spoons. The magnets and pole-pieces are of wrought-iron. The improvements effected are: the reduction of the resistance of the magnetic circuit and an intensely strong field created by a minimum expenditure of energy; and also owing to the strong field a less length of wire per volt in the armature is required, and a corresponding reduced resistance attained. Fig. 9 represents a continuous-current vertical dynamo with two magnetic circuits. In this machine rather less iron is required in the magnets, and although not so economical of wire as the single magnet, yet for many purposes, especially where lightness is a desideratum, it has a distinct advantage.

The power required for driving these various machines (that is for giving the armature the necessary speed of rotation) is usually furnished by a steam-engine or gas-engine, and transmitted to the machine by a driving-band as in fig. 9, or by ropes as in figs. 2, 3. This plan involves a considerable waste of power by the friction of the driving gear, and it is better to drive the machine direct from the engine as in fig. 6, which represents a pair of Gramme dynamos driven by a Brotherhood three-cylinder steam-engine, one and the same axle carrying the fly-wheel of the engine and the armatures of the two dynamos.

At one time the only kind of electric light in practical use was what is now called the *arc light*. The arc light is obtained by causing two sticks of carbon, one of them in connection with the positive and the other with the negative terminal of a battery or dynamo, to touch each other for an instant so as to complete the circuit, and then separating them and keeping them steadily at a small distance apart. Before the carbons have touched, the cold air between them prevents the current from passing, but as soon as they touch they become intensely heated, and if they are not separated too far the air between them is hot enough to serve as a conductor. The light is emitted partly by the ends of the carbons, especially of the positive carbon, and partly by the gaseous matter (containing also fine particles of solid carbon) which occupies the intervening space and forms the *arc* or streak of light joining the two carbon points. When the source of electricity is an alternating-current machine, each carbon is alternately positive and negative many times in a second, and the two points behave alike. When the source is a direct-current machine or a galvanic battery, the positive carbon wears away about twice as fast as the negative, and the positive carbon becomes hollow at the end, while the negative remains pointed. The hollow in the positive carbon is the brightest part of the whole arrangement, and when a beam of light is to be thrown in some definite direction, care should be taken that this hollow is exposed to view in that direction.

To keep the carbons at the proper distance apart a special contrivance called a 'regulator' is employed. There are many varieties of regulator, but they all depend on the principle that increase of distance between the carbons causes increase of resistance.

Hot air is, in fact, so much inferior to metal in conducting power that the resistance of the luminous arc between the carbon points is a very sensible part of the whole resistance in the circuit. In the older forms of lamp the weakening of current due to this increase of resistance is utilized by means of an electro-magnet and opposing spring, so as to set mechanism in motion for bringing the carbons nearer when they have become too far separated, and for bringing them into contact if the light has been accidentally extinguished. In some regulators the mechanism also separates the carbons when they are too near; in others, this duty is left to be performed by the consumption of the carbons. Fig. 8 represents the regulator invented by Piette and Kridik of Pilsen, and called the Pilsen regulator. It depends (like many others) upon the principle that a hollow coil through which a current is passing tends to suck a piece of soft iron into its interior.

S and M' in the figure are two hollow coils. M is of stout wire, and is in the same circuit as the carbons. M' contains a much greater length of much thinner wire, and is not in the same circuit as the carbons, but in a parallel circuit (technically called a *shunt*), so that the current from the machine on arriving at the lamp divides into two branches, the larger portion of the current taking the path of least resistance, which contains the two carbons and the coil M , while the other portion of the current (which is only a small fraction of the whole) passes through the shunt M' and rejoins the main portion on leaving the lamp. When the distance between the carbons increases, the resistance in the main branch is thereby increased, while the resistance in the shunt is unaffected. The two branches of the current are thus rendered less unequal than they were before, and the shunt electro-magnet M' is strengthened while M is weakened.

The upper (which is always the positive) carbon is hung from a movable piece of soft iron which is partly within M and partly within M' . M is constantly tending to suck it up, and M' to suck it down. We have just seen that increase of distance between the carbons strengthens M' at the expense of M , and diminution of distance will, of course, have the contrary effect. The upper carbon is accordingly sucked down by the preponderating action of M' when it has risen too high, and sucked up by M when it has sunk too low. The lower carbon is also movable, and is hung by pulleys in such a way that when one carbon rises the other must descend, so that they both approach or both recede, and by the help of a counterpoise the adjustments are so made that when the normal current is passing and the carbons are at the normal distance there is equilibrium. As the carbons burn away, the equilibrium is disturbed, to be restored by the action explained above. In order to the efficiency of this action it is necessary that a suitable shape be given to the movable piece of soft iron. It is made large in the middle and tapering to a point at each end.

As regards the material of the carbon sticks, Sir Humphry Davy used pieces of wood-charcoal, and the substance deposited in the interior of gas retorts has sometimes been employed, but it is now usual to employ a mixture of powdered carbon (from gas retorts), lamp-black, syrup, and gum, with a very little water. The sticks are obtained by forcing this pasty mixture through a draw-plate; they are then baked, and after being again impregnated with syrup, are heated to a high temperature.

Arc lights give the largest amount of light for a given amount of horse-power expended in driving the dynamo; but incandescent lights, which have been introduced more recently by Edison, Swan,

and other inventors, possess several advantages. Fig. 1 represents Swan's incandescent lamp and holder. The lamp consists of a glass vessel of globular form exhausted very perfectly of air. This vessel contains a fine elastic filament of carbon, which becomes incandescent when the current is sent through it. Its two ends are attached to two platinum wires which, where they pass out of the bulb, are hermetically sealed into its wall by fusion of the glass around the wires. These two wires are connected to two small brass plates held in a brass socket by means of cement. This socket fits into the holder, and is fixed by a bayonet joint, contact with the small brass plates being made by two springs inside. Owing to the absence of oxygen there is no combustion in an incandescent lamp, and hence the carbon does not waste away. All the incandescent lamps agree in having a carbon filament held *in vacuo*, but they differ in the mode of preparation of the carbons and in other details.

The light of an incandescent lamp is extremely steady, affording a great contrast to the flickering which is seldom altogether absent from arc lights. Its temperature is lower, and hence its colour is not blue or violet, like most arc lights, but slightly yellow, though whiter than gas. It is superior both to gas and to the arc light in giving off no products of combustion to vitiate the air of an apartment. Fig. 4 represents a cluster of Swan lamps with opal shades, as used in theatres and similar places.

The Jablochkoff lamp, which is represented in fig. 10, occupies an intermediate place, but more nearly resembles the arc lamps. The two sticks of carbon are side by side at the distance of $\frac{1}{2}$ inch or $\frac{3}{4}$ inch according to the power of the lamp, and this intervening space is occupied either with plaster of Paris or China clay. The lamp is lighted by temporarily inserting a piece of carbon to connect the ends of the two sticks, and after a fair start has once been obtained, the top of the plaster of Paris is hot enough to act as a conductor. Its incandescence contributes a portion of the light of the lamp, and it gradually burns away so as never to project quite so far as the carbons. Alternating currents are now always used with it, as the two carbons may then be exactly alike and will wear away equally.

When a number of electric lamps are supplied from the same source they may either be connected *in series* or in *parallel circuit*. The former term is applied when the same current goes through all the lamps in succession; the latter when the current is divided into branches, one branch going through each lamp. The *series* arrangement requires great electro-motive force in the source of electricity. It is also necessary to have a device so that if one lamp be extinguished it does not put out all the others in the same circuit. In the *parallel-circuit* arrangement, the extinction of one or more of the lamps does not affect the brightness in the rest. As the joint resistance of all the lamps in this arrangement is only a small fraction of the resistance of one, it is necessary that the armature of the machine which supplies the current should have extremely small resistance, otherwise there will be great waste of power by generation of heat in the armature. The Edison system of electric lighting is based on this plan. The Brush system lies at the opposite extreme, and is adapted for supplying a number of arc lamps in series. One form of the Brush lamp is represented in fig. 11. It is double, containing two arc lights within the same glass globe. Its regulator depends (like the Pilsen, above explained) upon the sucking action of a hollow electro-magnet upon a piece of soft iron within it.

A system of distribution known as the *three-wire*

system has been found very effective in allowing the use of higher electric pressures, whereby at a slight extra cost many additional lamps can be lit from the main leads. For this purpose two dynamos coupled in series are employed, the mains consisting of two heavy leads—one from the free terminal of each dynamo—with a lighter middle wire running from the coupling of the dynamos. The lamps are arranged in parallel between each of the outer leads and the middle wire, the function of which is to render the sets of lamps on each side of it independent of each other. Should the number of lamps lit be the same on each side there is no current in the middle wire, but should there be an excess in the number on one side, then a current equal to the difference of the current in the outer leads flows along it.

It is estimated that with incandescent lamps of about 20-candle power each, the light obtained is at the rate of from 200 to 250 candles per horse-power in the driving engine; and that in the largest useful size of arc lights—say 3000 candles each, the light is at the rate of about 2000 candles per horse-power.

ELECTRIC MACHINE (FRICTION). Soon after the discovery of the most elementary facts in the science of electricity, machines were arranged for the purpose of obtaining a more continuous supply of electricity than could be got by holding a glass rod or a stick of sealing-wax in the hand and rubbing it with a silk or woollen cloth. The first of these were spheres of resinous matter like sealing-wax, or glass globes, which were turned round on an axis passing through the centre, while a dry hand was applied as a rubber. Near the globe was hung a metallic bar, which was suspended by silk threads. This became electrified by sparks which passed from the electrified globe; and sparks were readily obtained from the conductor when the hand or any other body was brought near. This simple machine was tolerably effectual, but great improvements on it were soon introduced.

The *Edison machine* is shown in fig. 4, PL. ELECTRICITY I. A glass cylinder, *g, f*, is turned on its own axis by means of a handle. It is supported sometimes on pillars of glass *b* and *c*, but often on wooden uprights. *g* and *f* are two metallic cylinders with carefully rounded ends, which should be very smoothly finished to prevent loss of electrification from any pointed projections. They are supported on glass pillars *j* and *k*, and these pillars are usually carefully covered with shell-lac varnish to improve their power of insulation. To the conductor *g* (which is called the negative conductor for the reason that is explained below) is attached the rubber *x*, which is a long horse-hair cushion covered with silk; and a flap of silk attached to it lies on the top of the glass cylinder while it is being turned. The other conductor *f* carries a horizontal row of metallic points, like a comb, which point towards the glass cylinder; and a round knob or ball like that on the conductor *g*, but which is hidden in the figure, generally projects from it. *f* is called the *prime conductor* of the machine. Usually both the conductors *g* and *f* are adjustable by means of the screws *m* and *n*; the former is always adjustable in order that more or less pressure, as required, may be brought to bear on the glass cylinder.

When the cylinder is turned it is rubbed by the silk rubber and becomes excited; and when the part that has been rubbed is moved round so as to be opposite the metallic comb on *f* it is discharged by the points, the prime conductor thus receiving positive electrification, which it then gives off to any body brought near to it. The glass, discharged, passes on to be rubbed again by the silk at *x*. But it must be

observed that the mere rubbing of glass and silk together can do nothing more than establish a certain difference of potentials between these two bodies; and it will be recollected (See ELECTRICITY) that in working the machine, as we have described it hitherto, the silk rubber and the negative conductor are becoming negatively charged. Consequently, after a few turns at the most, when the negative conductor has reached a certain electrification, no more positive electricity is obtainable from the glass till the negative conductor has been discharged. For this reason the chain shown in the figure is led from the negative conductor to the earth, and the conductor is thus kept discharged. Under these circumstances a constant flow of positive electricity from the glass to the prime conductor is obtained.—If it be required for any purpose to obtain a supply of negative electricity the chain is removed from *g* and connected with the prime conductor, when negative electricity may be got from the former.—The efficiency of the machine is found to be much increased by smearing the silk cushion with an amalgam made by rubbing together in a mortar one part of tin, two of zinc, and six of mercury. This is usually put on mixed with a small quantity of lard. The effect in the way of increasing the power of the machine is very remarkable. Its action is not very well understood and is frequently discussed, but it seems likely that the chief use of it is to discharge the negative electricity of the silk more perfectly than could otherwise be done. The use of the flap of silk which is attached to the silk rubber and lies over the cylinder is chiefly to prevent dissipation of the electric charge which the glass receives at the rubber till it reaches the discharging points of the prime conductor. In working the machine great care must be taken to have the rubber and flap perfectly dry, and for this purpose the rubber is always made removable, and should be carefully dried before the fire. When the cylinder gets dirty, which it often does from the amalgam adhering to it, it ought to be washed with soap and water, and afterwards wiped with a cloth moistened with spirits of wine. The glass support of the prime conductor must be most carefully wiped free of dust and well dried and warmed. Attention to these points will make a difference in the working of the machine that can scarcely be believed without experience.

The cylinder machine, though excellent, was afterwards superseded by what is known as the *plate machine*, and this in turn has been almost entirely superseded by the *induction machine*. Of the plate machines, one form, Ramsden's, is shown in fig. 5 of same plate. In principle it is precisely the same as that just described. The plate is $\frac{1}{2}$ inch or more in thickness, and from $1\frac{1}{2}$ to 4 feet in diameter. The rubbers, of which there are two, one at the bottom, *r*, and the other at the top, are in the form of broad clips faced with horse-hair cushions which are covered with silk, and to which the silk flaps shown in the figure are attached: the flaps are kept in their place by stays of whalebone. The clips can be tightened on the glass by means of screws shown in the upper rubber. *H* is the prime conductor: it carries a comb attached to the leg at *a*, and another diametrically opposite to it. The prime conductor *H* is supported on a horizontal glass arm, which is seen through the glass plate. In all respects Ramsden's machine is similar in its working to the cylinder machine, except that the rubbers are not insulated on glass, and

the machine is therefore not fitted for giving negative electricity. The plate machine arranged by Winter of Vienna is a modification of that just described. Its chief feature is the addition of a great ring, which is attached to the prime conductor. This ring is constructed as follows. A very thick iron wire is bent into a circle of 3 or 4 feet in diameter at least. It is covered with mahogany, and looks like a wooden ring of 2 or 3 inches section. It stands vertically up above the prime conductor on a stalk made in the same way. Its use is to increase the capacity of the prime conductor, and when it is attached electricity is collected in great quantity, and issues from the conductor in the form of sparks or flashes to a body placed at 14 inches distant or even more. Other electric machines are described under ELECTROPHORUS, HYDRO-ELECTRIC MACHINE, INDUCTION (ELECTROSTATIC).

ELECTRIC MOTOR, a machine by which electrical energy, supplied from an external source, is converted into mechanical energy. The general principle underlying the action of the motor is embodied in the statement, that when two separate magnetic fields are brought within the sphere of each other's action, each is distorted from its original configuration on account of a tendency for as many as possible of the lines of force to coincide in direction. Accordingly if the material source from which one field is derived be fixed, while that from which the other is derived be free to move, motion of the latter ensues as the result of the mutual stresses set up between the two fields. The motor may thus be regarded as the converse of the dynamo, and any well-constructed dynamo may be used as a motor. (See DYNAMO.) In general structure the two are practically identical, but modifications in certain parts are usually given effect to, in order to adapt the machine for the purpose for which it is specially intended. For example, a motor is liable to be subjected to sudden stresses, and in the construction of the armature care must be taken that it is rendered able to resist such stresses without running risk of damage. When a motor has been started, a counter electro-motive force is produced which tends to diminish the current passing through the armature, and since a greater expenditure of energy is required to start a machine than to maintain it in motion after it has been started, this counter electro-motive force may be regarded as for many purposes furnishing a convenient automatic regulation of the current, which results in the greatest supply being forthcoming at the time when it is most required. The conditions which aid in making a motor to a great extent self-regulating may be attained if the resistance of the armature be very low, that of the shunt coils high, and the field developed by the field-magnets much higher than that developed by the armature. It is not so easy, however, in general, to attain these conditions in a motor as it is in a dynamo, and it is frequently necessary to use an auxiliary coil whose effect is to weaken the field when the current in the armature is at a maximum.

The motors made by Immisch are noted for excellent construction, for efficiency, and for great power combined with small weight. The majority have drum-armatures, the field-magnets being generally of the type known as the double horse-shoe. The leading features of the Immisch motors are the armature-core and the commutator connections. The core consists of thin iron discs separated by asbestos, with thicker discs (having projected driving teeth) at intervals and at the ends. The discs are all securely fixed to the shaft, and the armature windings are carefully insulated. The commutator connections are such as to cause the cutting out by the brush of certain armature-coils at each stage of the rotation, with the ultimate result that the brushes when set do not afterwards require to have their positions altered. A form of Immisch motor is shown in PL. ELECTRICITY I., fig. 11. A form

of motor designed by Sprague, and much used in America, is shown in same plate; and other forms which may be mentioned are the Thomson-Houston, Siemens, Cleveland, &c.

ELECTRIC RAILWAYS. See SUPPLEMENT.

ELECTRICS and NON-ELECTRICS. The chief work of the earliest experimenters in electricity was to divide bodies into *electrics*, which they could excite by friction, like amber (Greek, *elektron*, amber); and *non-electrics*, such as the metals, which they could not so excite. These names were given to the two classes by Gilbert of Colchester, 1600. But Du Fay (1733-45) showed that electrics are identical with non-conductors, and non-electrics with conductors; and that the reason why non-electrics did not exhibit excitement by friction was that the electricity was conducted away from them as fast as it was produced. The distinction was thus broken down. See ELECTRICITY.

ELECTRIC TELEGRAPH. See TELEGRAPH (ELECTRIC) and SUBMARINE CABLE.

ELECTRIC WELDING, the process of uniting together two pieces of metal, the necessary high temperature at the junction being obtained by the passage of a powerful electric current across it. The pieces of metal are placed end to end and subjected to some pressure. A very strong current is then sent along them, and as there is imperfect contact, and consequently a high resistance, at the junction, intense heat is developed there. The metals soon unite perfectly, and the junction is hammered into shape. In all cases the junctions must be perfectly clean, and different fluxes, depending on the nature of the metals, are used to prevent oxidation during the heating process. In the case of iron, borax is the flux usually employed. Since the currents employed for the purposes of welding are necessarily exceedingly powerful, it is found more economical to use for the purpose alternating currents which are passed through a transformer and emitted at a reduced pressure and an increased strength.

ELECTROCUTION, a method of carrying out the death sentence by the passing of a powerful electric current, at a high pressure, through the body of the culprit. The latter is strapped to a chair, and one of the electrodes from a suitable dynamo is applied to the head, the hair at the place of contact having been previously shaved off, while the other electrode is applied to the side of one of the legs. To ensure good contact small pieces of sponge, dipped in a solution of salt, are inserted between the skin and the electrodes. At a given signal the current is switched on and death is instantaneous. The method is practised chiefly, if not solely, in America. While in the experimental stage some revolting scenes occurred, and electrocution consequently came to be regarded with disfavour. Afterwards, however, with the experience gained, it became possible to conduct the execution speedily and painlessly, and the method is now used almost universally throughout America.

ELECTRODE (Greek, *hodos*, a way), a term introduced by Faraday to denote the wires or other terminals by which electricity either enters or leaves a body which is undergoing electrolytic decomposition, in order to avoid an implied theory connected with the use of the older terms *pole*, *positive pole*, *negative pole*. He called the electrode at which the current enters the *anode* (*ana*, upwards), and the electrode at which the current leaves the electrolyte the *kathode* (*kata*, downwards). The two latter terms have now been introduced in metallurgical practice; and the term electrode has become common in the more extended sense of the way by which electricity enters or leaves an instrument. For instance, we

speak of the electrodes of an electrometer or a galvanometer, and of the electrodes of a battery.

ELECTRO-DYNAMICS. That branch of electrical science which treats of the attractions and repulsions exhibited between wires or other conductors along which currents are passing. If two wires are parallel, they will attract each other when currents are passing the same way along them both, and will repel each other when the currents are opposite. If the wires are inclined to each other at any angle, there is not only an attraction or repulsion but a still more marked tendency to rotation which is not satisfied till the wires have become parallel and the currents flow in the same direction along them both. When there are only two straight wires these forces are feeble and require delicate apparatus for their exhibition; but by employing coils of wire the forces are multiplied, and an instrument constructed on this principle called the *electro-dynamometer* has been much employed for the measurement of currents.

The whole science of electro dynamics is due to Ampère, who discovered its main facts and reduced them by ingenious experiments, combined with very abstruse reasoning, to a single mathematical formula which includes them all.

ELECTRO-DYNAMOMETER. An instrument used for the measurement of electric currents by means of the mechanical forces which they exert upon each other. It contains two coils of wire, one fixed and the other movable; the latter being either larger or smaller than the other so as to be able to pass either outside it or through it. The coils are set up in vertical planes at right angles to each other; they have a common centre, and round the common central diameter of the coils the movable one can revolve. The terminals of the movable coil dip in cups of mercury, one of which is in connection with one end of the fixed coil, and the other with one of the binding-screws of the instrument. The other binding-screw is in connection with the other end of the fixed coil. Hence when the two binding-screws are connected with a battery or other source of electricity, the current has to pass through both coils. Its effect is exhibited by a tendency in the movable coil to set its plane in coincidence with that of the fixed coil, and in such a manner that the current will circulate the same way round both coils. This tendency is resisted by mechanical means provided for the purpose—usually by the torsion of a wire from the end of which the movable coil hangs; and the measurement is usually made by applying torsion until the planes of the two coils are at right angles. The amount of torsion thus applied is proportional to the mutual force exerted by the two coils, and this is proportional to the square of the current, since when we double the current through one we also double the current through the other.

ELECTROLYSIS (Greek, *lysis*, a loosening) is the chemical decomposition of certain compound bodies under the action of a current of electricity. In 1800, shortly after the discovery of the voltaic pile, Nicholson and Carlisle showed that if two platinum plates connected with the opposite extremities of a pile are made to dip into acidulated water, oxygen is given off at the plate connected with the copper end of the pile and hydrogen is given off at the other plate. Shortly after, Davy obtained the metal potassium by passing a current through fused potash, and soon many of the alkalies and alkaline earths were resolved into their elements. Faraday investigated the laws of electrochemical decomposition minutely; and our knowledge of these laws is chiefly due to him. It is one of the most important and interesting of all electric

phenomena, tending, as it does, to furnish us with an insight into the nature of the electric current on the one hand, and into the nature of chemical union on the other.

The following are the main facts to be mentioned. When an *electrolyte* (as a body capable of electrolytic decomposition is called) is subjected to a current of electricity of sufficient electro-motive force, it is broken up into two elements which appear, one of them at one electrode, and the other at the other electrode; thus, if two platinum plates connected with the battery be plunged in a trough containing fused chloride of silver the chlorine is given off at the plate by which the current enters, that is, at the plate which is connected with the copper plate of the battery, and the silver is deposited at the plate connected with the zinc plate of the battery. The two elements are liberated at these places in quantities chemically equivalent. Thus for every 108 grammes of silver deposited at one side of the vessel 35.5 grammes of chlorine are given off at the other side. If the electrolyte is composed of more than two elements it is divided up into two groups, which are liberated at the two electrodes in a similar way. Thus sulphate of sodium is decomposed into sodium, which is found at the electrode connected with the zinc end of the battery, and a group consisting of one equivalent of sulphur and four of oxygen, which are set free at the other electrode. When a compound consisting of a metallic and a non-metallic part is decomposed, the non-metallic part is set free at the electrode at which the current enters and the metallic part at the opposite electrode. In the case of acids, hydrogen acts as a metal, and the same may be said of the molecular group called ammonium by chemists (found in the salts ammonium chloride and sulphate) and of other corresponding groups.

Electrolysis takes place only when the electrolyte is in a liquid state. During electrolysis there is a transfer of the materials of which the compound is made up from one part of the vessel that contains it to the other. After a time we find (taking the instance above, chloride of silver) the silver collected at one side of the vessel, the chlorine having been given off at the other.

The following may be regarded as the facts known regarding the processes of electrolysis: (1) electrolytic conduction is the *result* of chemical decomposition, and takes place by means of it; (2) the atoms of which the molecules of the liquid are composed are of two kinds, one kind being charged positively and the other negatively, and it is something akin to a procession of the electro-positive atoms in the direction of the current that causes the transfer of positive electricity in that direction, while a corresponding procession of electro-negative atoms in the opposite direction causes a transfer of negative electricity in that direction; (3) the charge possessed by each atom is a multiple of an absolute unit quantity of electricity, which unit is independent of the nature of the atom; (4) when an atom arrives at the electrode and gives up its charge it escapes, but should it combine with anything else before escaping decomposition is not apparent; (5) should the atom not give up its charge it sets up an opposing electro-motive force, known as polarization, tending to diminish the current, and this polarization is manifested only at the electrodes.

The laws of electrolysis, which were discovered by Faraday, may be expressed as follows:—

The electrolytic action accompanying the passage of the current is the same at all parts of the circuit. If the current is made to traverse several vessels, each containing the same substance all in series

(that is, the current that leaves the first entering the second, and so on), it will be found that in each of the cells precisely the same amount of decomposition goes on. There will be as much silver, by weight, deposited at one side, and as much chlorine set free at the other.

The passage of the same quantity of electricity is accompanied by the decomposition of chemically equivalent quantities of different electrolytes. If, instead of passing the current through a series of cells, each containing the same electrolyte, we expose different electrolytes to its action, for example, water, fused chloride of silver, solution of sulphate of sodium, and collect the products of decomposition, we find that the quantities set free of hydrogen, silver, and sodium on the one hand, and of oxygen, sulphion (SO_2), and chlorine on the other, are strictly proportional to the chemical equivalents of these bodies. Further, in the battery which gives rise to the electric current, if precautions are taken to avoid disturbance by local action on the plates, it is found that the action which goes on in each of its cells is chemically equivalent to that in each of the decomposing cells. It is, however, to be remarked, that when such a body as sodium sulphate in solution is electrolysed the results are at first sight different from what has been stated above, for we find on comparing a cell containing sodium sulphate with a cell containing acidulated water that not only is the sodium sulphate electrolysed, but there is at the same time as much hydrogen given off on one side and oxygen at the other as in the water cell. This, however, is now recognized as *secondary action*: for the sodium set free at one side, combining with the water of solution, forms soda (Na_2O) and liberates hydrogen; while the sulphion (SO_2) set free at the other, combining with water, forms sulphuric acid and liberates oxygen. The decomposition of water itself is probably an example of secondary action. To decompose water it is necessary to acidulate it slightly, and this is usually done by the addition of sulphuric acid. The action which takes place probably is that the sulphuric acid (H_2SO_4), breaking up, yields hydrogen, H_2 , at one electrode, and SO_4 at the other, and that the oxygen observed to be set free is given off during the combination of the latter group with water to form sulphuric acid again. Thus the sulphuric acid remains undiminished in quantity during the action, and the elements of water alone are set free.

The quantity of the electrolyte decomposed in a given time is proportional to the strength of the current. The current being measured as usual by means of the galvanometer (see ELECTRIC CURRENT), it is found that a double current corresponds to double electrolytic decomposition, and the law stated above is found to hold with perfect exactness. On account of the definiteness of the action Faraday proposed to measure the strength of a current by collecting and measuring the quantity of the gas given off during the decomposition of water. (See VOLTA-METER.) The quantity of copper deposited in a given time from a solution of copper sulphate is a more convenient test, and is frequently used for very exact measurements of currents. (See GAUTHIER'S HYPOTHESIS.)

ELECTROLYTE. See previous article.

ELECTRO-MAGNETISM, the name applied to a very interesting class of facts, originally developed by Professor Oersted, of Copenhagen, in the year 1819. The power of lightning in destroying and reversing the polarity of a magnet, and in communicating magnetic influence to iron previously not magnetic, had long been known, and had led to the

supposition that similar effects might be produced by the common electrical or galvanic apparatus. The first observation of Professor Oersted was, that an electrical current, such as is supposed to pass from the positive to the negative pole of a voltaic battery, along a wire which connects them, causes a magnetic needle placed near it to deviate from its natural position, and to assume a new one, the direction of which depends upon the mode of conducting the experiment. When the wire extends in a north and south direction over a freely suspended compass needle, the needle deviates from the magnetic meridian: its north end being deflected to the east, if the current is from north to south; and to the west, if the current is from south to north. When the wire is beneath the needle, these rules must be reversed. When the wire is at the same level as the needle, and on either the east or west side of it, the needle is not deflected from the meridian, but one of its ends is raised and the other depressed. The rule for all cases is, that if you suppose the wire through which the current passes to be your own body so placed that the current enters at your feet, you will see the north pole deflected to your left. The deflecting force of a current on a needle always tends to set the needle at right angles to the current, and hence if the wire is held at right angles to the needle no effect is observed. Such was the nature of the first discovery in electro-magnetism. It was no sooner announced than the experiments were repeated and varied by philosophers in all parts of the world; and a multitude of new facts were soon brought to light through the labours of MM. Ampère, Arago, and Biot in France, and Sir H. Davy and Mr. Faraday in England. Two important discoveries were announced by Ampère and Davy,—that the wire which conveyed the current appeared to become itself a magnet, and that magnetic properties might be communicated to a steel needle not previously possessing them, by placing it near the electric current. The former of these facts was proved by throwing some iron-filings on paper, and bringing them under the wire, when they were observed to adhere to it, forming a tuft around it ten or twelve times the diameter of the wire; on breaking the connection with the battery they immediately fall off, proving that the magnetic effect depends entirely on the passage of the electricity through the wire. A battery of very large plates, such as is used for producing intense heat and light, was found to give the strongest magnetic effect round the connecting wire. Accordingly it was observed that the calorimotor of Dr. Hare, a galvanic arrangement in which the plates were several feet square, exhibited the strongest magnetic effects, and this notwithstanding the powerful heating or calorific effects that accompany its action. To communicate magnetic properties to steel needles, it is necessary to place them across the wire. They then become permanently magnetized, and retain their power equally with needles prepared in the ordinary way. The direction of magnetization depends on whether the needle is placed above or below the wire. When a needle is placed under the conducting wire the positive end of the battery being on the right hand of the operator, the end of the needle next to him becomes the north pole, and the other end the south pole. On the contrary, when a needle is held above the wire, the reverse of this takes place; the end next to the observer becomes the south, and the other the north pole. The same opposition is observed when needles are placed in a vertical position, on different sides of the wire; in those on one side, the lower ends are found to be north poles, while in those on the opposite side of the wire the upper

ends are north poles, and the lower extremities all south poles. The rule for all cases is that if you suppose the current to enter at your feet, the left-hand end of the needle will be the north pole. Contact of the steel needles with the conducting wire is not necessary, nor does the interposition of a plate of glass interfere with the magnetization.

In prosecuting these inquiries Ampère discovered another remarkable fact—viz. that when two wires, each of which has a current flowing along it, are brought near to each other, magnetic attractions and repulsions take place between them. When so arranged that the electric current passes along each wire in the same direction, the two wires attract each other; but when the electric currents in the two wires flow in opposite directions, the wires repel each other. Upon this experiment Ampère founded his celebrated theory of magnetism—viz. that it arises from the attractions and repulsions of currents of electricity constantly circulating around every magnet, as illustrated in the annexed figure

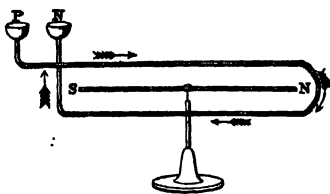


s being the south, and N the north pole. To account for these currents he supposes that the molecules of iron have circulating round them currents of electricity, which, when the iron is magnetized, are all caused to flow in similar directions. Thus to an observer looking on the pole s they would all appear to flow in a right-handed direction. It will readily be perceived that the resultant effect of these molecular currents would be the same as if currents were flowing in parallel circles round the magnet. The mutual repulsion of two magnetic poles of the same name, and the attraction of two dissimilar poles, are simple consequences of this hypothesis. It is conceived to explain also why the magnetic needle places itself at right angles to a wire conducting electricity, namely thus, that the electric currents circulating round the magnet tend to coincide in direction with that passing along the wire. The magnetic effects produced by galvanic arrangements are obtained likewise by electricity evolved from the common machine, and still more from the discharge of an electrified Leyden jar; the magnetism communicated agreeing in every respect as to the permanence of the polarity, the variations when the needle is placed above or below the wire, &c., with that produced by the voltaic pile.

Needles are most easily magnetised when the wire is formed into a hollow screw, or helix, and the needle to be magnetized, wrapped in paper or put into a glass tube, is placed in the centre of it, and the communication with the galvanic battery established. This arrangement conveys the electric current by the spiral convolutions, round and round the needle, and (according to the theory of Ampère) communicates to it, or develops in it, the electric circulation constituting magnetism. The position of the north and south pole depends on the direction of the current. The end of a left-handed helix at which the positive current enters becomes the north pole.

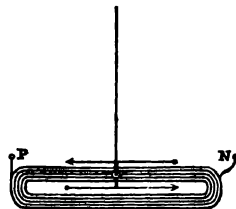
Galvanometers.—Not only did Oersted's great discovery fully establish the existence of an intimate connection between electricity and magnetism, but it furnished what had hitherto been wanting—a ready and convenient method of determining the presence, the direction, and the strength of a galvanic current. It is true that to produce a sensible effect on the magnetic needle with a single wire requires a

current of considerable power, but soon after Oersted's discovery the happy idea occurred to Professor Schweigger of Halle, that the effect might be multiplied by surrounding the needle with several convolutions of wire. The principle of this arrangement



will be understood from the simple elementary apparatus here represented. The needle *N*, supported on a fine point, is nearly surrounded by a wire bent into an oval or rectangular form, and terminating in the mercury cups *P*, *N*. If the end of a wire from the positive pole of a battery be dipped into the cup *P*, and that of another from the negative pole into the cup *N*, the current will proceed in the direction shown by the arrows, passing from left to right above the needle, and from right to left below it. Now, by referring to the explanation which has been given of the movements observed by Oersted when the needle was placed in different positions with regard to the wire, it will be seen that two currents, or two parts of the same current, one of which passes over the needle from south to north, and the other under it from north to south, will conspire to deflect the north pole of the needle westward; and in like manner, if the current be reversed, by reversing the connection of the battery-poles with *P* and *N*, the two parts of the current will conspire in deflecting the north pole eastward. By this simple arrangement, therefore, the action of the current upon the needle

is doubled; and by multiplying the convolutions of wire, as in the annexed figure, we increase the effect upon the needle in proportion to the number of convolutions, except in so far as the strength of the current is diminished by the greater resistance. In a coil of this kind,



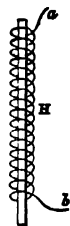
copper wire, as one of the best conductors, is generally used; and to prevent metallic contact between the spirals, and to compel the current to traverse the whole length of the coil, the wire must be covered with silk or other insulating substance.

The sensibility of an instrument of this kind is still further increased by using an *astatic* combination, consisting of two needles with their poles reversed, as shown also in the last figure—one of the needles being suspended within, the other above the coil. The opposing directive force of terrestrial magnetism is then nearly neutralized, so that a much larger deflection is obtained. The effect of the upper half of the coil on the upper needle co-operates with that of the entire coil on the interior needle. Two magnetized sewing needles passed, with their poles reversed, through a piece of straw, and suspended by a silk fibre, serve the purpose perfectly.

An instrument constructed on these principles, with or without an *astatic* combination, but provided with a circular scale of degrees, and the whole covered by a glass shade to protect the needle or needles

from currents of air (as shown in fig. 6, *Electromagnet II.*), is termed a *multiplicator*, and sometimes a *galvanometer*. There are various forms of galvanometer, all founded on the principle here indicated. See *GALVANOMETER*.

Electro-magnets.—We have seen that Ampère discovered the permanent magnetization of steel needles and the temporary magnetization of iron-filings by means of the electric current. We have stated also that he adopted the method of placing the steel needle or bar within a coil or helix of copper wire, and in doing so he found that if the helix *H* was wound from right to left over the needle, as at *b* in the annexed figure, the end of the needle at which the positive current entered became the north or marked pole, but if wound from left to right the end at which the current entered became the south pole. In 1826 Mr. Sturgeon of London first applied these principles to the construction of an apparatus which has now become of great value as an instrument of experiment and research, as well as for telegraphic purposes. Substituting a bar of soft iron for the steel



needle, he found that so long as the current passed through the coil a high degree of magnetism was excited, which almost entirely vanished the moment that the current was interrupted. Magnets of this description are therefore termed *electro-magnets* or *temporary magnets*. It is found, indeed, that soft iron is capable of receiving a much higher magnetism in this way than bars of steel, and there is the additional advantage over the permanent magnet that we can regulate the force either by varying the power of the battery or the extent of the coil, as well as reverse the poles at pleasure, by changing the direction of the current.

The most powerful electro-magnets for lifting purposes are those in which the iron core is bent into the form of a horse-shoe, as in fig. 10, so as to bring the two poles into such a position that they may act with their united force upon the *armature* *A B*. The copper-wire forming the coil must be insulated with silk or cotton, as in the galvanometer, so as to compel the current to traverse its entire length, and the wire must be wound invariably in the same direction in which it is commenced. In the figure the spiral is left-handed, and therefore the end at which the positive current enters, whether it be *A* or *B*, will become the north pole. At first it was usual to continue the coil along the whole length of the core; but experience has proved that the effect of the current is greatest towards the two extremities, and that when the wire is of considerable length the additional resistance introduced by continuing the coil along the middle portion more than counterbalances the advantage. The plan now generally adopted, therefore, is to cover with several layers of wire only the two limbs, and this is most conveniently done by first winding the insulated wire on short bobbins of brass tube, of sufficient diameter to admit the core, the limbs of which are inserted after the coils have been separately made. The wire must be coiled on the bobbins in such a way that in passing from the one to the other it shall proceed in the same direction as if it had been carried continuously around the entire length of the core. Fig. 7 represents an electro-magnet of this description, fitted in a wooden frame.

The wire that is used in forming the coil depends on the nature of the battery used to excite the electro-magnet. The rule for the most advantageous employment of the battery in this, as in all such cases, is that the internal resistance of the battery should be equal to the resistance of all the conductors outside it. Hence, with a battery of very small resistance thick wire for

the coil may be employed; but when the resistance of the battery is very great, the wire may be very fine and long. In coiling the wire on the magnets, thicker and thicker wire is used for the outer layers of the coil, as is stated under GALVANOMETER.

We have said that the magnetic power to be obtained by a current of electricity far exceeds what can be permanently imparted to steel. M. Pouillet constructed an electro-magnet for the Faculty of Sciences at Paris, consisting of two horse-shoes, each wrapped with 10,000 feet of copper-wire, and so arranged that the poles of contrary names should be in contact. With a current of moderate intensity this apparatus supported a weight of many tons. A small horse-shoe electro-magnet with a core of $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter, and 5 or 6 inches long, having three or four layers of covered wire of the thickness of bell-wire twisted round each limb, will lift 10 or 12 lbs. when excited by only a single pair of Smee's battery, with plates 4 inches square.

In constructing an electro-magnet the use of cast-iron must be avoided, as it partakes of the nature of steel; malleable-iron should be used; and even the purest and softest that can be made always retains a certain amount of attractive force after the current ceases. When a rapid motion of the armature is required, the effect of this residual magnetism may be neutralized by covering the surfaces of contact with varnish or thin paper.

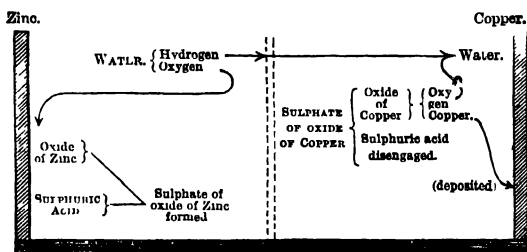
The principle of the electro-magnet is employed in the dynamo and motor for the purpose of producing a powerful magnetic field in which the rotation of the armature takes place. For this purpose the whole, or a portion, of the armature current may be employed in the field-magnets for the purpose of exciting the field. See DYNAMO, ELECTRIC MOTOR, ELECTRIC LIGHTING, MAGNETO-ELECTRICITY.

ELECTRO-METALLURGY, the art of depositing metals, from solutions of their salts, upon metallic or other conducting surfaces, by the agency of an electric current. Originally this art was known by the name of *electrotype*, because it was at first practised with a view to the multiplication of type, copper-plate engravings, medals, and other works of art; but it was soon found to admit of application to various metallurgical processes, such as the reduction of metals from their ores, the analysis of alloys, &c., and latterly it has almost entirely superseded the old methods of gilding and silvering. It has become, indeed, of great importance in various departments of industry, and hence the name *electro-metallurgy*.

The art may be said to have owed its origin to the introduction of Daniell's constant battery in 1836. It is true that in operating with different metallic solutions chemists and electricians had repeatedly observed detached facts depending on the same principles. Even so early as the year 1800—the same year in which Volta discovered the pile—Mr. Cruickshanks of Woolwich, in transmitting the galvanic current through an ammoniacal solution of copper, observed that metallic copper was precipitated, 'the purest he had ever seen'; and suggested 'that the galvanic influence might be employed with success in the analysis of minerals, more particularly in separating lead, copper, and silver, from their different solutions'. Again, in 1801, Mr. Wollaston observed that when zinc and silver plates were made to touch each other in sulphate of copper solution, copper was precipitated on the silver (Phil. Trans. 1801, p. 427). In 1805 Brugnatelli, professor of chemistry in the University of Pavia, wrote to Van Mons—I have

lately gilt in a complete manner two large silver medals by bringing them into communication, by means of a steel wire, with the negative pole of a voltaic battery, and keeping them one after another immersed in ammoniacal solution of gold' (Phil. Mag., 1805).

Yet these observations passed without much notice until the discovery of Daniell's constant battery, in which a metallic solution—sulphate of copper—is one of the two liquids employed, and a constant deposition of the copper is a necessary part of the action. For a full explanation of the principles and construction of this battery the reader is referred to the article DANIELL'S BATTERY; but as a thorough knowledge of its action is essential to a clear understanding of the subject of the present article, the annexed diagram may be found useful for this purpose. The dotted lines represent the porous partition separating the two liquids. On the left hand is the zinc plate immersed in water, acidulated with sulphuric acid; on the right hand the copper plate, in a saturated solution of sulphate of copper. On connecting the two plates by a wire the action begins by the combination of the oxygen of the water with the zinc, forming oxide of zinc, and this combines with the sulphuric acid (SO_4) to form sulphate of zinc (ZnO, SO_4), which is dissolved and accumulates in the liquid. The hydrogen of the water suffers a series of molecular displacements continued through the porous partition, and would be liberated at the surface of the copper



plate, but in the act of liberation it unites with the oxygen of the oxide of the sulphate of copper, so as to reconstitute water; and as the copper when deprived of its oxygen cannot combine or remain in combination with sulphuric acid, it separates, and is deposited in the metallic state upon the copper surface, while the sulphuric acid that is set free combines with the newly-formed water, for which it has a powerful affinity. There is therefore in this battery no disengagement of gas at the copper plate, and consequently no adhesion of hydrogen to it; but in place of the gas there is a constant deposition of metallic copper upon the copper surface.¹

In the same year in which this battery was made public Mr. De la Rue contrived a modification of it, and in a paper printed in the Philosophical Magazine for that year (1836) stated—'The copper plate is covered with a coating of metallic copper, which is continually being deposited; and so perfect is the sheet of copper thus formed that, being stripped off, it has the counterpart of every scratch of the plate on which it is deposited'. The same fact was repeatedly observed by Professor Daniell himself; but it was not until 1838 that the idea of its practical application to a useful purpose was first publicly suggested, and then it appears to have been made almost simultaneously in England and in Russia. In Oct.

¹ This statement is not in accordance with the language of modern chemistry. But as it represents the matter clearly from the older point of view, and as it is still employed in practice, we have retained it.

1838, M. Füss announced to the Academy of Sciences at St. Petersburg that Professor Jacobi had just made a discovery which promised important results for the art of copperplate engraving. The nature of the process was not then published, but in the *Athenæum* of May 4, 1839, a paragraph appeared stating that M. Jacobi had discovered a method of converting any line, however fine, engraved on copper into a relief, by a galvanic process, and that the Emperor of Russia had placed at the professor's disposal funds to enable him to perfect his discovery. In consequence of this announcement Mr. Thomas Spencer, of Liverpool, on the 8th of the same month, gave notice to the Liverpool Polytechnic Institution that he should make a communication to them of a process for effecting results similar to those of Professor Jacobi. He afterwards changed his mind with the view of reading his paper at an approaching meeting of the British Association, to which it was communicated for that purpose; but having been overlooked by the secretary, Dr. Dionysius Lardner, it was omitted at the British Association, and was read for the first time at the next meeting of the Liverpool Polytechnic Institution, on the 13th September, 1839. The paper contained a minute account of experiments connected with this subject, in which Mr. Spencer stated that he had been engaged from September, 1837. In one of his experiments he had dropped a little sealing-wax varnish on the copper electrode, and he observed that after a time the whole of it had received a deposit of copper, except those parts which were covered with the varnish. This suggested to him the idea that by covering the whole surface of the copper electrode with bees'-wax, or some other soft cement, and by writing or cutting through the wax with a sharp point, so as to expose the metallic surface beneath, letters or other figures might be deposited upon the plate in relief; and there is no doubt as to the fact, that by actually practising this process, he produced a plate which, with specimens of printing from it, was shown to some of his friends in 1838. On another occasion, not having a slip of copper at hand to form the negative electrode, he happened to make use of a copper coin for the purpose, and on pulling off the deposited metal he found that it exhibited an exact mould of a part of the head and letters of the coin. He was thus led to the idea of forming fac-similes of coins and medals.

This paper was read, as has been stated, in September, 1839. In the following month a letter addressed by M. Jacobi to Mr. Faraday, dated the 21st of June, appeared in the *Philosophical Magazine*, in which the writer stated that he had been led by a happy accident to the discovery of a method of taking metallic proofs in relief from engraved plates, and that by practising the same process with the proofs themselves, fac-similes of the originals could be produced. He stated that the apparatus which he employed was a simple Daniell battery, in which the ordinary copper electrode was replaced by the engraved plate, or by a copper mould taken from the plate; and he added two important facts then new:—1. That with the current from a simple voltaic pair the sulphate of copper might be reduced in a separate vessel by using two copper electrodes; and, 2. That with this arrangement it was unnecessary to add crystals of the sulphate in order to keep the solution saturated, as this was effected by the gradual oxidation and dissolution of the positive electrode in proportion as the metal deposited itself upon the negative. M. Jacobi remarked also, as Mr. Spencer had done, that not only copper itself, but other metals and alloys might be used to receive the copper deposit.

It is evident that Professor Jacobi and Mr. Spencer

are about equally entitled to the merit of having invented that department of electro-metallurgy which is commonly known as the electrolyte. It is but just, however, to state that on the 22d May, 1839, Mr. Jordan, a book-printer in London, addressed a letter to the *London Mechanics' Magazine*, in which he stated that he also had been engaged in experiments in the course of the preceding summer with the view of obtaining impressions from engraved copperplates by the aid of galvanism; and although it appears that he was only partially successful, and had not the leisure or the pecuniary means necessary to prosecute the subject, still as the publication of his letter preceded that of Professor Jacobi's, and even the reading of Mr. Spencer's paper, there is no doubt that he is also entitled to share the credit of the discovery.

The electro-chemical deposition of one metal upon another, and particularly of gold and silver on less precious metals, with a view to their permanent adherence, is quite a distinct department of the art; and although we have seen that this was effected by Brugnatelli in 1805, it was not until 1840 that M. De la Rive, the celebrated Swiss electrician, proposed to employ this method in the arts as a substitute for the old process of gilding. The liquid used by De la Rive was a solution of chloride of gold in very dilute salt water. Immediately afterwards much improved methods, both for gilding and silvering, were patented by Mr. Elkington in England, and by M. de Ruolz in France.

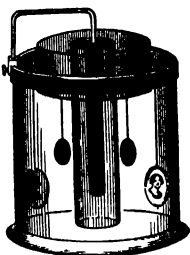
The extraction of silver and other metals from their ores by electro-chemical action was first proposed by M. Becquerel, the elder, in a paper communicated to the French Academy of Sciences in 1836. Lately the proposal of M. Becquerel has found an important application. M. Luckow has devised a process for determining with great rapidity and precision the value of copper ores, by precipitating metallic copper by means of a galvanic current from a nitric acid solution of the ore, and then weighing the metallic copper as such. His method, besides saving time, does away with the necessity for the multitude of complicated operations usually required.

For practising the electrolyte on a small scale, a single cell arranged on the principle of Daniell's battery is sufficient, and affords the simplest illustration of the process. Let *r*, for example, be a porous tube containing dilute sulphuric acid, and a cylinder or slip of zinc *z*, and let this be introduced into a jar or tumbler filled to the same level as the liquid in the porous tube with a saturated solution of sulphate of



copper. In Daniell's battery the outer or containing vessel is generally constructed of copper, and acts as the negative plate; but in electrolyting it must be formed of glass or stoneware, and the place of the negative plate is supplied by the moulds, medals, or other objects, *m*, intended to receive the deposit. Any number of these may be connected with the zinc plate by wires, as shown in the figure; and as soon as the plate is inserted the action commences. In the course of a few hours a considerable thickness of compact metal will be deposited on the objects suspended in the sulphate of copper solution; and if this deposit be pulled off, it will, of course, exhibit an exact reverse of any impression on the original. To obtain, therefore, any number of fac-similes of the original, it is only necessary to place this reversed copy in the sulphate solution, to serve as a mould for receiving new deposits.

Coins or medals are usually suspended in the solution by means of a copper wire twisted tightly around their edges or circumferences, so as to secure them as in a ring; one face of the object is then covered with wax or gutta-percha, and the other, after being well cleaned, is slightly moistened with sweet-oil, or brushed over with black-lead, to facilitate the removal of the deposit. The annexed figure shows a convenient arrangement for suspending a considerable number of medals in the same vessel, the metallic rim serving as a common conductor for all of them.



It is manifest that a deposit can only take place on a conducting surface capable of acting as the negative plate or electrode of a voltaic combination. The art of the electrolyte was, therefore, at first supposed to be limited to metallic objects; but in January, 1840, it was announced by Mr. Robert Murray, at a meeting in the Royal Institution, that non-metallic objects were rendered sufficiently conductive to receive a deposit by simply rubbing them over with black-lead. Of this important discovery it is not too much to say that it far more than doubled the value of the electrolyte process. Not only did it bring within the range of the art natural and artificial objects of almost every description, but it furnished the means of expeditiously taking moulds, even from metallic objects, in substances suitable for the purpose. Before the announcement of this discovery moulds could only be taken by impressions in soft metals, or by the tedious and troublesome method of deposition. Mr. Spencer had succeeded to some extent in taking impressions from type in lead, which he afterwards used as the mould; but this method, imperfect at best, was evidently quite unsuitable for objects in high relief, or incapable of sustaining a very severe pressure. Metallic moulds were afterwards formed with much greater success by taking impressions in *clichés*—that is to say, by means of fusible metal in a semi-liquid state. Either of the following alloys may be used for this purpose:—

Tin.	Lead.	Bismuth.	Zinc.
4	1	0	0
1	1	2	0
1	2	3	0
1	0	1	1
5	10	1	0

Whichever of these compositions be used, the ingredients are melted and thoroughly mixed together in an iron ladle. The medal or coin to be copied is brushed over with a little sweet-oil, and bound round the edge with a slip of tin or card. The alloy, in a state of fusion, is then poured into a small tray, and when it begins to set, or is just on the point of solidifying, the operator brings the medal suddenly upon it, face downwards. This is a process which requires considerable skill and practice to be successfully managed, and scarcely admits of application, except to the amateur business of copying coins and medals. On the contrary, by the use of plumbago, every substance that is capable of receiving an impression is rendered suitable for electro-chemical deposition. Wax, stearic acid, compositions of wax and rosin, plaster of Paris, and gutta-percha, are now extensively used for this purpose in the arts. The last-mentioned substance, in a state of purity, is found to be peculiarly suitable for taking fine impressions; it

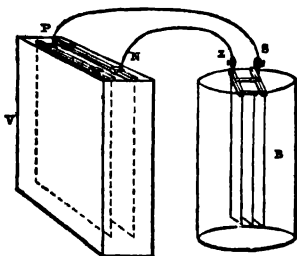
is easily softened by heat, becomes very firm and solid when cold, and possesses the valuable property that it is not acted upon by acids. It also readily takes on the black-lead. Moulds of plaster of Paris are prepared with the finest material, mixed with sufficient water to give it the consistence of thick cream. In this form it is poured upon the face of the object to be copied, and when it has sufficiently consolidated to be removed with safety, it is thoroughly dried at the fire, and afterwards saturated with wax at the impressed surface. On receiving a coating of plumbago it is ready for use. Bees'-wax, with or without stearine, is prepared for moulds by melting it over a slow fire, then stirring into it a little white-lead, and afterwards re-melting the mixture two or three times. It is then poured out upon a tray, and when it has acquired sufficient consistency the wood-out or other object to be copied is placed upon it face downward, and subjected to powerful pressure. If the process has been well managed the impression will be perfect; and when placed in a metallic frame, and coated with plumbago over the impressed surface and part of the frame, it is ready to receive the copper deposit. Mr. Gore recommends, as an excellent composition for moulds, a mixture consisting of two parts of gutta-percha and one part of Jeffrey's marine glue. The latter, in small pieces, is melted at a gentle heat in an iron ladle; the gutta-percha, also in minute fragments, is then added, and the whole stirred until thoroughly incorporated. When gutta-percha is used alone it may be simply heated in boiling water till quite soft, and an impression from small objects can then be taken upon it by means of copying-press.

For taking moulds of busts, statuettes, or other ornamental or natural objects which do not present a flat surface, Mr. Parkes of Birmingham patented an elastic composition, similar to that used by letter-press printers for their inking-rollers, and consisting of a mixture of glue and treacle, in the proportion of 4 lbs. of the former to 1 of the latter. The object from which a mould is to be taken, if a plaster bust, is well oiled, and introduced into a smooth cylindrical vessel of sufficient depth to allow the object to be more than covered by the composition. The vessel is also oiled; and when the composition has been poured in and allowed to cool, the whole is easily taken out by inserting the vessel upon a table. The mould is then cut up the back with a sharp knife, and held open while an assistant lifts out the bust, after which it is allowed to re-close, and tied round to keep it firm. The interior is now a perfect mould of the object; and though it cannot be inserted directly in any electrolyte solution, being composed of a highly soluble material, it furnishes the means of preparing any number of casts or fac-similes of the model in materials suitable for that purpose. A mixture of wax and rosin, with occasionally a little suet or stearine, is generally used, and is poured into the mould after being allowed to cool down till it just retains its fluidity, so as not to melt the mould. A number of wax models of the bust or other figure may thus be obtained, and these, being covered with plumbago, may be employed to receive a copper deposit, from which, when sufficiently thick, the wax can be melted out, and the interior is then prepared, by washing it with alcohol and acids, for receiving a deposit of one of the precious metals. A perfect fac-simile of the model is thus obtained in silver or gold, and finally the copper shell is dissolved off by acids, which do not attack the nobler metals.

Mr. Parkes patented also a process for imparting a conducting power to the surface of objects so complex, or so much undercut, that black-lead cannot be conveniently applied. Three liquids are required for

this purpose, respectively termed the phosphorus solution, the silvering liquid, and the gilding liquid. To prepare the phosphorus solution, 64 grains of wax or tallow are melted, then 8 grains of finely-cut caoutchouc are dissolved in 160 grains of bisulphide of carbon, to which the melted wax or tallow is added, and the mixture well shaken; 64 grains of phosphorus are now dissolved in 960 grains of the bisulphide to this 80 grains of spirit of turpentine and 64 of powdered asphalt are added, and the solution is mixed with the former. The model or mould, which has guiding wires extending into all the hollow and distant parts of its surface, is dipped into this solution for one minute. When dry it is immersed in the silvering liquid, which is made by dissolving 18 grains of pure silver in about 20 grains of nitric acid, and diluting with 20 ounces of distilled water. In one or two minutes, when the surface appears like black china, it is taken out and washed, by pouring distilled water over it. It is then treated in a similar way with the gilding liquid, which is made by dissolving 54 grains of pure gold in about 22 grains of aqua regia, and diluting with 20 ounces of distilled water. This solution gives the mould a yellowish bronze appearance, and after being washed it is ready to receive a deposit of copper, or any other metal. Either the silvering or gilding liquid may be used separately with good effect, but the best results are obtained by dipping the object in both solutions. This process is chiefly applied when a permanent coating of gold, silver, or any other metal is to be deposited upon the model.

In the processes of electro-gilding and silvering, and in all electro-metallurgical operations conducted on a pretty large scale, a separate battery is generally used, which may be either a Daniell's, a Smee's, or a Wollaston's (see GALVANISM). Grove's and Bunsen's batteries are seldom used in these operations, on account of the disagreeable fumes which they generate. To illustrate the separate cell arrangement, let us suppose that we have to take a cast in copper upon an engraved plate of the same metal, or on any plumbagoed surface. A solution of sulphate of copper is introduced into any convenient vessel, *v*, across which are placed two metallic rods; and supposing *b* to be a cell of Smee's battery, one of the rods *r* is connected with the silver plate of the battery by the wire *s*, and the other rod *x* with the zinc plates by the wire *z*. If a plate of copper be now suspended from the rod *r*, and the object intended to receive the deposit from the rod *x*, the battery circuit will be completed through the liquid in the vessel *v*, and the current will proceed in the



direction *s* *r* *x* *z*, passing from *r* to *x* through the sulphate of copper solution. In doing so the water contained in that solution is decomposed; its oxygen unites with the copper plate or positive electrode *r*, and its hydrogen unites with the oxygen of the oxide of copper in the sulphate, so that the metal is set free and is deposited upon the negative electrode. The ac-

tion is precisely the same as in Daniell's battery, except that the sulphuric acid which is disengaged by the deposition of the copper unites in this case with the oxide of copper formed at the positive electrode, keeping up a constant reproduction of the sulphate of that metal exactly in proportion as it is reduced at the surface of the negative electrode. If a plate of silver, or even of platinum, were used for the positive electrode, copper would still be reduced upon the plate suspended at *x*, but in that case it would be necessary to keep up the strength of the solution by adding, from time to time, fresh crystals of the sulphate, as in using the single cell; but when a plate of copper is suspended at *r* this addition is unnecessary, however long the process may be continued; and generally, whatever metal is being deposited, a plate of the same metal should always be used for the positive electrode. Zinc, for example, may be deposited from a solution of the sulphate of that metal; but if the positive electrode were of copper, the first portion of zinc deposited would convert the decomposition trough *v* into an active voltaic arrangement, having its poles in the reverse order of those of the working battery, and a contrary current would be set up, which would greatly diminish, if it did not entirely overpower, the force of the battery current.

We have stated that this separate battery arrangement is generally used in the processes of electro-gilding and silvering, which we shall now briefly describe. Gilding on metals was formerly performed by amalgamation, a mixture of finely-divided gold and mercury being rubbed over the object, and the mercury afterwards driven off by heat. This process was very detrimental to the health of the workman, as the fumes of mercury are extremely poisonous. 'The old authors,' says Mr. Smee, 'draw most dismal pictures of the horrors of mercurial inhalations, and not without cause; for it is not at all uncommon for the medical man to witness salivation, universal trembling of all the limbs, nervousness, nay, even death itself, from this powerful agent.' In silver-plating the method formerly used, and still practised to some extent, consists in soldering a piece of silver upon a bar of copper, and subjecting the metals thus united to the dilating process of heavy rollers. By this process, as the two metals extend equally, the silver, being very ductile, is reduced to an exceedingly thin covering. The plated metal is then manufactured into the required forms, and the different parts of complex vessels, or other utensils or ornaments, soldered together. It is evident, indeed, that articles could only be plated by this process before being manufactured into the required shape, and that this imposed heavy restrictions on taste and design, compared with the entire freedom and facility of merely depositing gold or silver by electrical agency on articles already manufactured. It is worthy of remark, also, that when worn through in any part, articles plated by the old method were valueless, before the introduction of the electro-process.

For electro-gilding, the auro-cyanide of potassium makes the best solution. It may be prepared by dissolving gold in three parts of hydrochloric (muriatic) acid and one of nitric acid, which forms the chloride of gold. This is digested in calcined magnesia, and the gold is precipitated as an oxide, which is boiled in strong nitric acid to dissolve any magnesia in union with it. The oxide, being then well washed, is dissolved in cyanide of potassium, which gives the auro-cyanide of that metal, or, in other words, a cyanide of gold and potassium.

For silver-plating the argento-cyanide of potassium is the best solution, and may be formed in much the

as the auro-cyanide. In the first place metallic silver in fragments is dissolved, with gentle heat, in four parts of nitric acid, diluted with one part of water. The solution of nitrate of silver thus formed is further diluted with ten parts water, and dissolved cyanide of potassium is then added, so long as a white precipitate falls. This precipitate is cyanide of silver. When it has sufficiently settled down the clear liquor is carefully decanted, and, after the precipitate has been well washed to remove the soluble salts, a solution of cyanide of potassium is added to it until it is completely dissolved. The resulting liquid constitutes the argento-cyanide of potassium, which forms the silvering solution.

Another and preferable method of preparing both the gilding and silvering liquids consists in employing the battery current itself to dissolve the required amount of gold or silver in the cyanide of potassium solution. For this purpose, as much of the latter as is intended to be used is made of the strength of one and a quarter ounce of the salt to the gallon of water. A porous cell is then introduced into this solution, and is filled to the same level with the same liquid. A plate of copper or iron is put into the porous cell, and connected with the zinc terminal of the battery; in the outer solution is put a sheet of gold or silver, according as the object is to obtain the auro-cyanide or the argento-cyanide, and this is connected with the copper terminal of the battery. The required quantity of gold or silver will be dissolved in the liquid in the outer vessel in the course of a few hours. By weighing the sheet of the precious metal before and after the operation, the quantity that has been dissolved will be ascertained. For silver, the solution should contain at least one ounce of that metal to the gallon; and for gilding, from one-half to an ounce of gold in the gallon. There is no other difference between the processes for the two metals, except that in preparing the gold solution, and for all the operations of gilding in which it is used, the liquid must be heated to about 150° Fahrenheit—a precaution which is not necessary in preparing or operating with the silver solution.

The process of gilding is generally performed upon silver articles; and these, before being gilt, merely require to be well brushed, and then kept in clean water until they are immersed in the depositing solution. In gilding iron, tin, or lead, it is usual to deposit a slight film of copper upon these metals before introducing them into the auriferous bath. The metals best adapted for silver-plating are copper, brass, and particularly German silver. The latter composition is now generally used for all new work. In plating and gilding a principal object is to render the deposited metal as fixed as possible; and with this view it is necessary to remove from the surface intended to receive the deposit every particle of grease and oxide. This is sometimes done by simply scouring the articles with sand or emery paper, or with very fine pumice-stone powder applied by means of scratch-brushes; but generally the articles are prepared for silver-plating by being first boiled in a strong ley of caustic potash or soda, and then dipped into nitric acid, diluted to such an extent as to act very slightly upon the metal; they are then scoured with a hard brush and very fine sand, and after being washed thoroughly and dried they are carefully weighed. The article to be plated is then dipped into a mixture of sulphuric and nitric acids, technically termed *pickle*; after which it is again washed by immersion in distilled water, and then quickly dipped in a solution of nitrate of mercury until it appears white on the surface; finally, it is suspended in the silver solution by the wire connected with the zinc pole of the battery, when it is immediately coated with a thin film of

silver. This operation is termed *striking*. After a few seconds it is taken out and well brushed, generally with bundles of brass wire attached to a lathe; it is then washed and replaced in the plating solution, where it is allowed to remain for a longer or shorter period according to the battery-power employed, the strength of the solution, and the thickness of deposit required. Generally an immersion of a few hours is sufficient for the purposes of commerce. To ascertain the amount of metal deposited it is only necessary to reweigh the articles after the operation, or even during its progress. One and a quarter to one and a half ounce of silver to the square foot of surface gives an excellent plate about the thickness of common writing paper.

In ordinary circumstances the coating of deposited silver is chalk white, and has a dead or matted appearance, which is much esteemed for medals. Sometimes the operator is desirous of having his object bright, either entirely or partially, so that the bright and dead parts may form a contrast with each other. In this case the object is brushed over with old ale or beer, or dipped into a solution of soft soap, to which, in the case of gold, a little prussic acid is added, and then it is submitted to the burnisher. There is a method, however, by which the silver may actually be thrown down with a metallic lustre. This consists in adding to the silver solution a little bisulphide of carbon, collodion, or sulphur. Sesquichloride of sulphur and the hyposulphite of either potash or soda may also be used for the same purpose; and a solution of iodine and gutta-percha in chloroform is said to be more permanent in its effect than bisulphide of carbon, but the latter is most generally used.

Some of the vats used for silver plating are 6 feet in length by 30 inches in breadth and depth, and contain from 200 to 250 gallons of liquid: but for the gilding solution the troughs are generally much smaller, and are fitted with steam-jackets to keep them at the required temperature.

When the articles to be gilt have been cleaned and dried they are weighed, and one immersion is given, of merely sufficient duration to impart a bluish gold. They are then taken out, brushed, and re-immersed. If the battery and solution are in good order three or four minutes will suffice to gild any small article. When gilt it is again weighed, and the quantity of gold deposited is thus ascertained. When the power of the battery is properly adjusted to the strength of the solution the deposited gold should be of a dark brownish yellow, and this when burnished will yield a beautiful rich deep colour. If, on the contrary, the battery be too strong, the colour of the gold when taken out will be black; and if the battery be rather weak, and the solution too cold, the deposit will be light-coloured.

Besides gold, silver, and copper, the deposition of other metals by the electro-chemical process has not hitherto been attended with much advantage, and to enter into minute details on the subject would be a waste of time. The depositing liquid employed for electro-zincing is made by dissolving 2 lbs. of sulphate of zinc in a gallon of water, and to work the solution a separate battery and a zinc electrode are necessary; but iron and other metals are much more easily and economically coated with zinc by the method improperly known as *galvanizing*, which consists in immersing them in a bath of the melted metal. Mr. Smee states that iron may be deposited from a solution of the proto-sulphate of that metal by connecting the object upon which the deposit is to be effected with the zinc of the battery, whilst an iron nail is connected with the silver or copper pole. He adds, that as the source of power a relatively small single

cell will suffice, and that the reduced metal is brighter and rather whiter than polished steel, but soon tarnishes in the air. The deposition of this metal may appear a superfluous operation, but it has proved useful for giving a hard surface to copper duplicates of steel plates.

It cannot be doubted that at present one of the most important applications of this art is to the purposes of printing and engraving. In large printing establishments it was lately a common practice to give an increased durability to stereotype plates by depositing on them a film of copper. Instead of this a duplicate in copper is now taken from the page of type by means of a mould of wax or other plastic substance, and afterwards giving the requisite thickness to the plate with the softer stereotype metal—a plan applicable with even better results to engravings on wood. Another somewhat similar application of the art is the multiplication of engraved steel or copper plates. This is accomplished by taking a copper deposit from the original plate, to be used as a mould for producing the plate for the printer. The currents required in electro-metallurgy are now largely supplied by dynamos specially adapted for the purpose. They are, of course, of the continuous-current type, and supply large currents at a low, steady E.M.F. An illustration of the Siemens electro-metallurgy dynamo is given on Plate ELECTRICITY I.

ELECTROMETER. An electrometer is an instrument for measuring differences of electric potential between two conductors through effects of electrostatic force, and not, as in galvanometers of all varieties, through certain electro-magnetic effects of electric currents produced by them.¹ In the report from which the above definition is quoted a list of eleven different electrometers is given: some of them are of very imperfect construction, and rather come under the name electroscope than under the name electrometer. The reader is referred for full information to that report. All that we can do here is to indicate the *principles* on which one or two of the most important forms of electrometer are constructed.

The inventions of Lord Kelvin have brought electrostatic measurement to a state of great perfection. Besides his electrometers, and Coulomb's torsion balance, which will be found described elsewhere (see *TORSION BALANCE*), we only mention here two instruments of importance, Peltier's electrometer and Delmann's electrometer. Neither of them, however, requires description: they are completely superseded by those about to be explained.

1. *The Absolute Electrometer.*—If two flat parallel plates of infinite extent are attracting each other on account of a difference in their electrification, and if we know the force of attraction exerted by one on the other per unit of area of its surface, and the distance between the plates, we can calculate the difference of potentials between them. This is the principle made use of in the absolute electrometer. It is not possible to employ infinite plates; but it can be shown that if the distance between the plates is very small in comparison with their length and breadth, and if the force of attraction is not estimated by means of points near the edges, the result is practically the same as if the plates were infinite. The absolute electrometer consists essentially of two flat circular horizontal plates, the lower of which is insulated and can be electrified, and which can also be moved up or down—that is, nearer or farther from the other. The second plate, which is connected with the earth, is much smaller than the first. It is

hung by a spring, and when it is attracted by the other plate is drawn downwards. When an experiment is being made, the lower plate, which we suppose electrified, is moved up or down till it is in such a position that the upper plate is drawn down to a position exactly marked, which we may call the standard position. By means of previous experiments, made by putting small weights on the upper plate, it is determined exactly what force is necessary, acting against the spring, to draw down the plate to this position. Hence the force of attraction exerted by the lower plate is known, and the distance between the plates is read off on a scale. The difference of potentials between the plates can be calculated from these data. We have remarked above that the force of attraction must not be measured by means of points near to the edges of the plates. The upper plate, the attraction on which is estimated, is therefore, as we have already mentioned, made much smaller than the lower plate; and it is surrounded by a broad flat ring, called the *guard ring*, which is fixed, but which, when the plate is in the standard position, is precisely in the same plane with it. The plate is thus a movable part in the middle of the plane which it and the guard ring together form.

2. *The Portable Electrometer.*—In this instrument there are two flat circular parallel plates, of which the lower one is kept permanently electrified to a constant potential by means of a Leyden jar arrangement. In the centre of this plate is cut a square hole, in which there is suspended a thin square of sheet aluminium, precisely on the principle of the common machine for weighing carts, except that instead of levers and weights the torsion of a fine platinum spring, on which the aluminium plate is suspended, is the force against which the attraction on the plate is exerted. A light index arm, attached to the plate, stretches out to the circumference of the brass plate, and its position shows with great exactness when the aluminium plate is in its standard position. The upper plate of the instrument is movable, and can be brought nearer or withdrawn from the lower plate, and by a scale the distance between them is read off. It is insulated, but a wire attached to it can be connected with any electrified body, or with the earth. To use the instrument, this wire is first connected with the earth, and the upper plate is moved up or down till the index is in the standard position. The *earth reading* is then taken. The wire is now connected with the body to be tested, and a second reading is taken as before. The difference of these gives the *difference of potentials between the earth and the body tested, in terms of the scale of the instrument*. To reduce such readings to *absolute measure* a previous experiment must be made for comparing the instrument with the absolute electrometer, or with one the values of whose indications in absolute measure are known.

3. *The Quadrant Electrometer.*—The movable part of this instrument consists of a very light 'needle,' or rather plate, shaped like a canoe paddle, of thin sheet aluminium, which is supported by a bifilar suspension, and turns in a horizontal plane. It is connected with a Leyden jar, which forms part of the instrument; and the Leyden jar is kept at a constant potential by means of a small electric machine founded on electrostatic induction, and called the 'replenisher.' A light mirror, as large as a three-penny piece, is attached vertically to the needle, and turns with it, just as in the case of the *mirror galvanometer*. Opposite the instrument is placed a horizontal scale, with a slit or hole in the middle of it. A lamp placed behind this slit sends a ray of light to the mirror, which it reflects back to the scale, and the position of the light on the scale indicates the angle, if any, through

¹ The definition here given is taken from Lord Kelvin's Report to the British Association (1867) on *Electrometers and Electrostatic Measurements*
Vol. V.

which the mirror and needle have turned from a standard position. This completes the testing part of the instrument and the index.

The needle is surrounded by a hollow cylindrical box of brass. The box is divided into four quadrants, each of which is insulated by being supported on a glass stem; and the suspension of the needle passes down through a hole at the middle of the top of the box, while a wire carrying a weight that is attached to the centre of the needle passes down through a similar hole in the bottom of the box. The opposite pairs of the quadrants are connected together; and from each pair of quadrants an electrode proceeds to the outside of the instrument, which is otherwise completely inclosed from the air to preserve the insulation of its parts. Let us suppose, now, that the Leyden jar, and therefore the needle, is electrified positively, and that one pair of quadrants are connected with the earth, while the other pair are connected by means of their electrode to the body to be tested. If the body is positively electrified the pair of quadrants connected with it will repel the needle at both ends, and it will therefore turn round so as to be under the pair of quadrants connected with the earth; but if the body tested be negative the needle will be attracted. The needle turning, and carrying with it the mirror, the spot of light will be seen to move along the scale, and will take up a position depending on the intensity of the attraction or repulsion as compared with the torsion of the bifilar suspension of the needle. See Plate ELECTRICITY I., fig. 14.

ELECTRO-MOTIVE FORCE, a term used in connection with batteries and other sources of electric supply to denote the difference of potential existing between the plates or terminals, in consequence of which there is a tendency for a current to flow when the plates are connected together by a conductor. The seat of the electro-motive force in the voltaic cell is a question which has given rise to considerable discussion. Considering, for the sake of simplicity, the case of copper and zinc in acidulated water, the view of the matter which meets with general acceptance may be stated briefly as follows: the electro-motive force has its origin in the chemical action which takes place within the cell, and the only difference between the plates when immersed in air and when immersed in acidulated water lies in the fact that the latter acts as a conductor. An isolated zinc plate is at a lower potential than the surrounding air—a statement which is also true, though the difference is not so great, in the case of copper isolated in air. The reason that each is at a lower potential than the air is that oxygen atoms display an affinity both for zinc and copper, although to different extents, and the electrostatic strain set up by the tendency of the negatively-charged atoms to move towards the zinc and copper respectively causes a lowering of potential in each case. The difference of potentials between air and zinc and between air and copper can in fact be calculated from the experimental determination of the heats of combination of oxygen with zinc and copper respectively. So long as the plates are isolated the surrounding negatively-charged oxygen atoms are unable to give up their charges, since the plates are attacked equally by the atoms in all directions; and if the latter could give up their charges the process would result in the plates receiving negative electricity without corresponding positive electricity being communicated elsewhere. When the plates are connected together the strained atoms are removed from the place of contact and each plate is rendered capable of receiving a charge. A flow of negative electricity from the zinc to the copper then occurs, this direction of flow being the result of the greater affinity

of the zinc for oxygen. This flow of negative electricity from zinc to copper results in the zinc showing positive electrification and the copper negative electrification. So far the explanation applies equally to the immersion of the zinc and copper in air or water. In the former case the air acts as a non-conductor, and the current ceases, but when acidulated water is used the negative charge is conveyed back again from the copper to the zinc, and the flow becomes continuous.

An induced electro-motive force takes place when a closed conductor is made to rotate in a magnetic field, provided the number of magnetic lines of force cutting the conductor is altered during the rotation. The electro-motive force is measured by the time rate of decrease of the number of magnetic lines cut, and the absolute unit of electro-motive force is that produced when one magnetic line is cut per second. The practical unit or volt is equal to 10^8 absolute units, and is $\frac{1}{111.8}$ of the electro-motive force of a standard Clark cell at 15°C .

ELECTROPHORUS (Greek, *phero*, to bear), an instrument for obtaining electrification by means of electrostatic induction. The instrument is shown in fig. 1, PL. ELECTRICITY I. A circular tin dish of convenient dimensions is filled with some resinous mixture; one of the best consists of equal parts of resin, shell-lac, and Venetian turpentine. The materials are melted together and poured hot into the mould or form. The cake may be from $\frac{1}{2}$ to $\frac{3}{4}$ inch thick. This is called the *sole* of the electrophorus: it is now often made of a flat circular plate of ebonite, the under side of which is covered with tin-foil. A flat plate of brass, B, with well-rounded edges, very nearly covers the sole, and a glass handle D for lifting the plate B is cemented into the cap C.

To obtain electrification by means of the electrophorus, the resinous plate, or sole, is excited by rubbing it and striking it briskly with warm dry flannel or cat-skin. It thus becomes negatively electrified. The brass plate is now set down on the sole and touched with the finger. On approaching the finger a slight spark is seen to pass, and when the brass plate is raised by means of the glass handle, which should previously be well dried, it is found to possess a positive charge. Being discharged it may be set down again on the resinous plate, touched with the finger, and again raised; and this may be done many times, and a charge of positive electricity obtained each time without the necessity of exciting the resinous plate again.

The following is the theory of the instrument:—The brass plate, when set down on the sole, touches it only in a few points, owing to the rigidity and the unevenness of both plates. If it were then lifted it would be found to carry away from these points a faint negative charge. But the greater part of it being not in actual contact with, but only in close proximity to, the remainder of the resinous plate, which is negative, the brass plate becomes excited by induction, and when the finger is brought near, negative electricity passes from the brass plate to it (just as in the elementary experiments on electrostatic induction), positive electricity being held attracted by the negative electricity of the resinous plate. When the brass plate is raised the positive electricity is set free, and is ready to be discharged. The use of the metal form, or the tin-foil pasted below the ebonite, is to admit of perfectly free charge and discharge of the lower surface of the resinous plate when the brass plate is lifted and set down.

Instruments have been constructed acting by induction, to which the name *rotatory electrophorus* has been given. The Wimshurst and Van induction machines (PL. ELECTRICITY I.) are of this class.

ELECTROSCOPE (Greek, *skopeō*, to look), an instrument for detecting the existence of an electric charge, and generally also for determining whether it is positive or negative.

One of the most elementary kinds is shown in fig. 3, Pl. **ELECTROSCOPY** I., connected by a chain to the Leyden jar. It consists of two small balls of rush or elder pith, A, attached to fine wires or threads (if threads, they must be conductors). The wires or threads are carried by the brass hook B, which is supported on a glass stem fixed into the foot C. A charge of electricity coming, let us say, from the outside of the jar along the chain D, electrifies the ball A, as well as the wires by which they hang; and being similarly electrified they repel each other and stand apart, as shown in the figure. This is the oldest kind of electroscope: it (or rather a pair of straws hanging down) was used by Beccaria, Volta, and others early in the eighteenth century. It is quite superseded by—

Bennet's Gold-leaf Electroscope, introduced in 1789. This instrument, as improved by Volta (see below), and now called condensing electroscope, is shown in same plate. In it Beccaria's pair of straws are replaced by a pair of gold leaves, which, when the instrument is uncharged, hang down in contact. They are shown diverging under the influence of a charge in the figure. They are attached to a \perp piece of brass, the upper part of which is connected with the circular plate on which, in the figure, a second metallic plate, with a glass handle attached, is resting. The whole is supported by a dome-shaped glass, through which the upper stem of the \perp piece passes, and the dome is covered with a coating of shell-lac or sealing-wax to improve the insulating power of the glass. The dome-shaped glass is supported on a wooden frame and surrounded by a cubical box of glass: and the instrument is completed by two upright pillars of brass, between which the gold leaves hang down. The upper circular plate to which the glass handle is attached is Volta's addition. Leaving it out of account for the moment, and supposing it removed, the gold-leaf electroscope is used in the following way:—A body to be tested is brought near to the plate of the instrument. If it is electrified, electricity of the kind similar to that with which it is charged will be driven by induction towards the gold leaves, which will therefore diverge by mutual repulsion. This is sufficient for a test of electrification of the body presented. If it be desired to determine the kind of electricity with which it is charged, the plate of the instrument is touched with the finger when the body to be tested is near to it. Being thus put in connection with the earth, while at the same time it is under inductive influence from the charged body, electricity similar to that of the charged body passes away through the hand, and the gold leaves fall together again. Removing the finger the electroscope is left charged with the opposite kind of electricity, which, however, is held bound, as it is sometimes called, by the attraction of the body that is still near to it. But let this now be removed, and the charge, set free, spreads itself over the gold leaves and causes them to diverge. We have now to determine what kind of electricity the electroscope is charged with, recollecting that the body tested is charged with the opposite kind. To do this we electrify a stick of sealing-wax, and also a rod of glass, and bring them, first one and then the other, near to the plate of the instrument. One of them will make the leaves diverge more by driving more electricity of the same sort towards the gold leaves; the other, by attracting some of the electricity which they possess, will cause them to fall together. It is evident that the instrument is charged with electricity similar to that which gives the leaves an increased

divergence, and the body tested was therefore charged with the opposite kind.

Volta's Condensing Electroscope is similar to that just described, but the brass plate connected with the gold leaves is covered with a coat of shell-lac varnish, and on this rests the upper plate, which we may call the condensing plate, shown in the figure, and which is removable by means of the glass handle. This is in fact an *Epinus'* condenser attached to the gold leaves, and has the effect of increasing the capacity of the plate of the instrument while the condensing plate is present. The use of the condenser will be readily understood from the description of *Epinus'* Condenser under **INDUCTION (ELECTROSTATIC)**.

The Single Gold-leaf Electroscope.—In this instrument a single gold-leaf, supported as in the instrument just described, hangs down between two metallic plates which are supported on horizontal wires that pass through the sides of the dome-shaped glass in the figure. They are held fixed by passing through corks that fit into holes pierced in the glass, and they are thus insulated from the ground. The ends of the wires outside the glass are furnished with binding-screws, and to these may be attached the electrodes from a galvanic battery, and the plates on the two sides of the gold-leaf are thus kept, one of them positively, and the other negatively electrified. Suppose the gold-leaf now to receive a slight charge, either positive or negative, it is attracted by one plate and repelled by the other, and it tends towards the side whose electrification is opposite to its own. The instrument may be rendered as delicate as we please by bringing the plates very near to the gold-leaf, and by increasing their electrification.

Bohnemberger's Electroscope is similar to that just described, except that, instead of the plates kept electrified by a battery, it is furnished with two *dry piles*, which stand vertically, one on each side of the gold-leaf, the positive pole of one, and the negative pole of the other, being uppermost. Their opposite poles are connected together by the sole of the instrument. It is also usually furnished with Volta's condensing plate. The latter two instruments are now rarely employed.

ELECTROSTATICS is the part of the science of electricity that treats of the phenomena of electricity at rest. The terms *electrokinetics* and *electrokinematics* (see **DYNAMICS** for an explanation of these terms) are also employed by the most philosophical writers on electricity; but they cannot be said to be at present in popular usage. We have already considered a portion of the subjects that might fall under *electrostatics* in our article **ELECTRICITY**: and according to the plan of this work other matters that might in a consecutive treatise come under the name will be found under **INDUCTION (ELECTROSTATIC)**, **CAPACITY (SPECIFIC INDUCTIVE)**, **ELECTRIC MACHINE**, &c. Here we propose to give a brief account of the mathematical laws of electric attraction and repulsion, and the distribution of electricity in conductors, together with some remarks that will indicate where additional information on the mathematical theory of electricity at rest may be found.

The elementary experiments described at the beginning of our article on **ELECTRICITY** give us the following general law, that similarly electrified bodies repel each other, and dissimilarly electrified bodies attract each other. An electrified body of either kind also attracts an unelectrified conductor, and this, taking the fact along with our knowledge of induction, we readily see is because by induction the opposite kind of electricity to that of the attracting body is drawn to the nearer side of the neutral body, and is more powerfully attracted on account of its greater proximity than is repelled the equal quantity of electricity similar to that of the attracting body.

The exact quantitative laws of electric attraction and repulsion were first investigated by Coulomb. Coulomb's investigations were carried on with the assistance of his *torsion balance*, which is shown in plate ELECTRICITY I. (see also the article TORSION BALANCE). Essentially its construction is as follows: A light horizontal arm, *f*, carries a gilt pith-ball, *g*, at one end, and a counterpoise at the other. It is suspended by a fibre of glass, or a fine wire, which is attached to the torsion head, *D*. The vertical arm, *f*, which is also made of insulating material, supports a second gilt ball, *g*, precisely similar to the first. The second ball is removable, and can receive an electric charge, which in the position in which the balls are represented in the figure it immediately divides with the other ball. Repulsion ensues, and the force of repulsion is tested against the torsion of the fibre. Attractive forces are examined by first charging the ball *g* on the horizontal torsion arm with, let us say, positive electricity, and then turning the torsion head till the ball is at the opposite side of the glass case from that at which it is shown in the figure. The ball *g* on the vertical support is now introduced into the case charged with negative electricity, and the attraction of the two balls is observed by means of the torsion of the suspending fibre. To determine the law according to which quantity of electricity influences attraction and repulsion it is necessary to be able to vary the charges on the balls in some determinate manner. For this purpose Coulomb used a third ball equal and similar to the other two. When two equal balls, one of them charged, are put in contact, the charge divides itself *equally* between them. Thus by successive contacts with one or both of the balls, always discharging the third ball, he was able to subdivide the charges on them to any extent required.

Experimenting in the way here indicated, and making use of precautions exquisite in their refinement, Coulomb arrived at the following beautifully simple laws:—

1. The force of attraction or repulsion between two electrified points is proportional to the product of the numbers that express the quantities of electricity at the points.

2. The force of attraction or repulsion between two electrified points is inversely proportional to the square of the distance between the points.

The unit of quantity used in electrostatic measurements (see UNIT, ELECTRICAL) is the quantity which, placed at unit distance from an equal quantity, attracts it or repels it with unit force. Hence multiplying together the numbers that express the quantities of electricity on the balls, and dividing by the square of the distance between their centres, we obtain a number which expresses the force of attraction between them. The two laws are thus expressed by the following simple formula. Let *F* be the force of attraction or repulsion, and let *q*, *q'* be the quantities of electricity on the balls, while *D* is the distance between their centres; then—

$$F = \frac{Q \times Q'}{D^2};$$

and if to the symbols *q*, *q'* the signs + and - be prefixed according as the charges on the respective balls are positive or negative, we shall evidently have repulsion or attraction between the balls according as the sign of *F* is positive or negative.

The only advance that has been made in this respect since Coulomb's time is the establishing of his laws by an indirect method, susceptible of greater experimental accuracy. This may be explained thus:—Assuming the laws stated above as

strictly exact, we may deduce by mathematical reasoning a certain proposition with regard to the distribution of electricity on conductors, which is very easily put to the test. The proposition may be stated as follows, viz.: *If the law of the inverse square of the distance holds exactly, then the whole of the electricity on a charged conductor must reside strictly at the surface of the conductor.* This hypothetical proposition is due to Cavendish. The most delicate tests that modern refinement has been able to apply have shown no deviation whatever from its truth; and our evidence for the exactness of the law is as precise as our evidence for the exactness of the law of gravitation.

We have already stated the fundamental law of the distribution of electricity on conductors. A multitude of experiments may be given in proof and illustration of it. We mention here a beautiful experiment due to Faraday, and known as the 'ice-pail experiment'. Let an ordinary ice-pail be insulated, and connected with a delicate gold-leaf electroscope; and let a metallic ball, suspended by a silk thread, be charged and lowered into it. The gold leaves will be seen to diverge on account of induction; but when the ball is raised from the interior they will be seen to fall together again, and the ball will be found to possess its electrical charge. But let the ball be lowered down till it touches the bottom, and then raised out of the ice-pail. It will be found to have communicated its charge to the ice-pail, and the leaves will have a permanent divergence. Let the electroscope now be discharged, and let the ball be tested with it, and it will be found completely diselectricified, not having carried with it the faintest charge from the interior of the ice-pail.

When a conducting sphere is electrified the charge is uniformly distributed over the surface, but with conductors of other forms this is not the case. Coulomb, testing with his *proof-plane* (which see), showed that the electricity is collected on the more outlying portions of the conductor. Thus in an elongated cylinder, or in an egg-shaped body, the greater part of the electricity is to be found at the ends, and but little in the middle of it. The quantitative investigation of the distribution of electricity on conductors was undertaken by Coulomb in several cases, and the results of his experiments are in complete agreement with the results of the later mathematical investigations of Poisson.

It is impossible here to give a more complete account of the results of these investigations. The subject is beset with difficulties both to the experimenter and to the mathematician. A few cases have been examined—for example, those of a cylinder, of an ellipsoid of revolution, and of two spheres in contact with each other. The chief investigators of the subject are Coulomb, Cavendish, and Faraday, among experimentalists; and Poisson, Green, Charles, Lionville, Kelvin, among mathematicians. The papers of Kelvin published in the Cambridge and Dublin Mathematical Journal, and in the Philosophical Magazine, and reprinted collectively (1872), may be consulted for a full exposition of all that has been done in the mathematical theory of electricity. Amongst the most noteworthy treatises on the mathematical theory of electricity may be mentioned Clerk Maxwell's *Electricity and Magnetism*, and *Electrical Papers* by Oliver Heaviside. The former contains Maxwell's brilliant theory regarding the identity in kind of light and electro-magnetic vibration, a theory which the experimental investigations of Hertz and others have completely confirmed. Heaviside's work is devoted chiefly to the elucidation and extension of Maxwell's theory, and of the mathematical methods suited to it.

ELECTRO-TINT, an art by which drawings are traced by the action of electricity on a copper plate. The design is drawn in some varnish not affected by acid and placed in an electro-bath, the lines being thus brought out in relief.

ELECTROTYPE. See **ELECTRO-METALLURGY**.

ELECTRUM (Greek, *ēlektron*), a substance first mentioned by Homer, with regard to the nature of which there has been much discussion, some maintaining that it was amber, others that it was an alloy of gold and silver. The following is the most recently advanced opinion. The term *ēlektron* originally meant gold, just like *chrysol*; but while the latter came to be applied specially to the refined metal, the former was employed to denote native gold, which frequently contains notable quantities of silver, copper, and other metals. The term employed for this native alloy, transferred to the artificial alloy of gold and silver afterwards made, was applied also to amber on account of its colour and inferior lustre. The word is referred to a root signifying splendour, like the sun, and etymology based on the property of amber to become attractive of light bodies falls to the ground.

ELECTUARY (Latin, *electuarium*), a medical preparation mixed with sugar, now called a confection (*confectio*).

ELEGIT, in English law, a writ by which a creditor who has obtained a judgment against a debtor, and is hence called the *judgment-creditor*, may be put in possession of the lands and tenements of the person against whom the judgment is obtained, called the *judgment-debtor*, until the debt is fully paid. The writ is addressed to the sheriff, who enforces it; but he only gives a legal right to possession: if this is resisted the creditor must proceed by recovery. When the creditor's claim is fully satisfied, the debtor may obtain his property by an action for recovery of land, or by reference to one of the masters of the court from which the writ has issued. The creditor in possession is called *tenant by elegit*.

ELEGY, commonly a mournful and plaintive poem, as is implied by the signification of the Greek name—(*elegos*, usually derived from $\epsilon\lambda\epsilon\gamma\epsilon\iota\sigma\iota$ *legetin*, to cry woe!) But the Greeks and Romans had elegies which were so called only from the measure of the verse, and were on various subjects. The elegiac measure of the ancients was the distich (which see), consisting of the hexameter alternating with the pentameter. In this verse, not only sorrow breathes soft lamentations, but joy and love pour themselves forth in its flowing numbers. Even the war-songs of Tyrtæus and Callinus were in elegiac verse, as were also many of the didactic and heroic poems and moral maxims of the ancients. As the distich was a favourite measure for epitaphs and inscriptions on tombs, a little poem of this sort came to be called an *elegy*. The distich, however, as already mentioned, was never used exclusively for mournful poems, and hence it is well to distinguish poems in elegiac verse from elegy itself. Goethe and Voss, like the ancients, have happily applied this measure to joyful subjects. In the other modern languages elegy commonly signifies a mournful poem.

ELEMENTARY EDUCATION. See **SCHOOLS**.

ELEMENTS. The history of the elements is the history of philosophy. This is absolutely true of the earlier Greek systems, the aim of which was to discover the universal which would explain all phenomena. The reconciling of systems led to closer observation of particulars; the defects in accumulated observations occasioned new theories, these led to controversies, which again returned to observations. Gradually the elements appeared as vague qualities, and philosophers occupied themselves, some with inquir-

ing, not what is that of which all the diverse forms we see is composed, but how do we see it! what are the conditions of our seeing it! leading to the theory of knowing; while others applied themselves to the matter-of-fact study of natural phenomena. It is from the latter class that the modern doctrine of the elements is derived.

Guided partly by Aristotle's classification of first principles, fire as dry and hot, air as hot and moist, water as moist and cold, earth as cold and dry, which included both the forms and properties of matter, and allowed of indefinite gradations, partly by observation and inference, that what can be got out of a body must be one of its constituents, the medieval chemists, who were specially devoted to the study of metals, metallic ores, and mineral substances, and the effect of heat upon them, supposed that the metals consist of an elemental sulphur and an elemental mercury mixed together more or less perfectly, and in different proportions. To these were subsequently added salt and some others to express the results of experiment, so that about two hundred years ago the first principles amounted to five, and were divided into two classes: the active, consisting of mercury or spirit, sulphur or oil, and salt; and the passive, consisting of water or phlegm and earth, or the terrestrial part. It was at this time that Boyle attacked both the Aristotelian and the chemical elements, but his suggestion that undecomposed bodies should be considered as elements was without any marked effect. The names remained, not so much as denoting substances or ultimate principles as gradually coming to denote functions; and as the problems in chemistry grew more defined, and the study was taken up by men of thought, the first great modification was the expansion of the idea of elemental sulphur into phlogiston by Stahl. The power of the hypothesis was soon displayed in the recognition of a common character in apparently dissimilar actions, and this influenced opinions regarding the elements. Much less attention was given to them because actual discoveries were making on all sides, and the adherents of the phlogistic theory soon gave up the old elements and applied the term to phlogiston, to the gases then discovered, the mineral, vegetable, and animal acids, the alkalies, earths, and metallic calces, oil, alcohol and water. The substances considered as simple naturally changed with the change of theory introduced by Lavoisier, and he therefore considered as elements, oxygen, nitrogen, hydrogen, sulphur, phosphorus, and carbon, the metals and the earths, and further practically defined as an element a body not yet decomposed. This conception of an element seems to have been tacitly employed by all subsequent chemists, and is now the common definition of the term. The remaining step in the simplification of the elements was made by Davy, who, decomposing the alkalies into metals and oxygen, opened the way for the reduction of the earths, so that in a few years the elements were reduced to two great classes, the metals and so-called non-metallic elements. Later investigations have generally tended in two directions: one to reduce the number of the elements by resolving two or more of them into one, the other to classify the elements according to some marked character. These attempts have not succeeded to expectation. No simplification of elements has ever been effected, while their actual number has increased. The classifications hitherto devised being founded on one or two characters only, have yielded imperfect results when applied to other characters. Such are the classifications into non-metallic and metallic, into electro-positive and -negative. In the article **CHIMISTRY** the more recent classification, according to atomicity, is given, which is also open to similar objections. The

most comprehensive of all the arrangements hitherto proposed is based upon the view that the elements form a great but very incomplete series of bodies, which may be divided into sections and groups, these divisions, however, serving to indicate the analogies between the corresponding members of the groups, as well as their differences. The results of this arrangement are very remarkable. Solitary unexplained phenomena become significant by correlation, the distinction between non-metals and metals disappears, and the shading off of one set of elements into another, which defeats every attempt at minute classification, is seen to be one of the main arguments for viewing them as a whole; the blanks existing in the series show that all the elements have not yet been discovered, and the whole arrangement is so cross-checked by the data obtained from chemical and physical properties alike, that it forms an excellent criterion for ascertaining whether already ascertained facts are reliable or not. It is difficult to say what will be the succeeding phase in the history of the elements. At present the number of bodies regarded as elementary exceeds seventy, several of them having been discovered as recently as the last decade of the nineteenth century.

ELEMENTS, MAGNETIC. In terrestrial magnetism the complete specification of the magnetic force at any place and time is given by stating the *magnetic elements* at that place and time: these are the magnetic declination, the magnetic inclination, and the horizontal magnetic force. The declination at any place is the angle made by the magnetic axis of a needle free to turn in a horizontal plane with the astronomical north and south line: the inclination is the angle by which the magnetic axis of a needle free to turn in a vertical plane containing the *magnetic north* and south line dips from the horizontal. (See **DECLINOMETER** and **DIPPING NEEDLE**.) The total intensity is a number which expresses the force of magnetic attraction at the place and in the direction of the dipping needle. It is properly expressed in *absolute units of force*. (For full information, see the article **MAGNETOMETER**.) From this the *horizontal magnetic force* is derived by multiplying it by the *secant of the angle of dip*.

ELEMI, the name of various fragrant resins obtained mainly from trees of the order *Burseraceae*. The common West Indian or hard elemi, obtained from species of *Bursera*, is yellowish or greenish, opaque or translucent, with a fatty lustre, friable, and very fusible. It is slightly heavier than water, and is readily soluble in ether, in turpentine, and in alcohol, but insoluble in water. African elemi is obtained from *Boswellia Freereana* or *Santiriopsis balsamifera*; the Brazilian kind from species of *Protium* or *Toica*; Manila elemi from *Canarium comense*, and the Mauritius variety from *Canarium paniculatum*. Elemi is a regular constituent of spirit varnishes, and the Manila kind is used in plasters and ointments.

ELEPHANT, a well-known and sagacious animal of the order of Proboscidea, the largest of living quadrupeds. There are at least two distinct living species, the Asiatic elephant (*Elephas Indicus*) and the African (*E. Africanus*); and a third species, the Sumatran, is recognised by some zoologists. The Asiatic is readily domesticated, and is thus the best known; while the African, not now domesticated, is considerably the larger. There are also several extinct species, whose remains are met with in almost every part of the world. Few quadrupeds have attracted more attention from mankind than the elephant. Formed, as it were, for the service of man in warm climates, it possesses every attribute that can render it useful. It is strong, active, and persevering, and so docile and sagacious

as to be trained to almost any service. It is not easy to convey in words a distinct idea of the form of any animal, and this difficulty is peculiarly felt in attempting to describe the elephant, whose appearance, however, is well known. His eyes are extremely small, his ears very large and pendulous. The whole form is awkward, the head being large, the body massive, and the neck short; the legs are very clumsy and shapeless, the feet slightly divided into, or, more properly, edged with, small rounded hoofs; the tail is somewhat like that of a hog, and fringed at the extremity by a few very thick, long black hairs. The skin is thick, sparsely covered with hair, and generally of a deep ash-brown, approaching to black, though it is sometimes white or cream-coloured. Elephants of this last sort (which are really albinos) are highly prized in Siam, being one of the attributes of royalty, and one of the titles of the king is, *lord of the white elephant*. The tusks are not visible in young animals, but in a more advanced stage of growth they are eminently conspicuous, and in a state of maturity they project, in some instances, 7 or 8 feet, if not more. These tusks are enormously developed upper incisor teeth. The largest on record (possibly that of an extinct species) weighed 350 lbs.; 60 lbs. is a common weight. Elephants sometimes attain the height of 15 feet, but their general height is about 9 or 10. Their weight is sometimes enormous, being from 4000 to 9000 lbs. The female is gravid twenty months, and seldom produces more than one at a birth: this, when first born, is about 3 feet high, and continues to grow till it is sixteen or eighteen years of age. They are said to live to the age of 100 years and upwards. They feed on vegetables, the young shoots of trees, grain, and fruit. The most singular part of the structure of the elephant is his trunk, which is peculiar to this animal, though the long and flexible snout of the tapir bears some resemblance to it. It is produced by the combination and great development of the nose and upper lip, is formed of muscular and membranous tissue, and is composed of numerous rings. A septum divides it throughout its whole length, and it terminates in a kind of movable finger. It is of such strength as to be capable of breaking off large branches from trees, whilst, at the same time, it is endowed with such exquisite sensibility that it can grasp the smallest object. The natural disposition of the elephant is gentle, and his habits social; hence they are commonly seen in herds or families, one individual of which acts as leader. Elephants living in a solitary state are usually very dangerous, and are known as 'rogues'.

The elephant is found wild in certain localities in Hindustan, in mountainous and forest regions; in the districts lying north-east of the peninsula and in all south-eastern Asia it is plentiful; it occurs also in Sumatra and in Borneo, but in the latter is scarce. In Africa it is widely spread, but is becoming less numerous year by year, on account of the eagerness with which it is pursued for its valuable tusks. In no one locality, probably, is the elephant so abundant as in Ceylon, especially the elevated forest regions of the inland. Here, as Sir J. E. Tennent remarks in his work on Ceylon (which contains perhaps the best account of the animal written), 'from time immemorial the natives have been taught to capture and tame them, and the export of elephants from Ceylon to India has been going on without intermission from the period of the first Punic war. . . . In recent years there is reason to believe that their numbers have become considerably reduced. . . . Not one elephant in a hundred is found with tusks in Ceylon, and the few that possess

them are exclusively males.' In India elephants now form a government monopoly. The shooting of them is prohibited except when they become dangerous to man or too destructive to crops; and the right of taking them is only granted by special lease. Any person capturing, killing, or injuring an elephant renders himself liable to a considerable fine. Elephants are caught either singly or in herds. In the former case much skill and boldness is required, it being necessary to catch adroitly one of the elephant's legs in the noose of a strong rope which is then quickly attached to a tree; another leg is then caught, and lastly the animal is securely fastened by all four. His captors then encamp beside him, it may be for a few weeks, and under their treatment he becomes tractable. When a number are to be caught a strong inclosure is constructed, and into this the elephants are gradually driven, being surrounded by a great many beaters, who do all in their power by fires, noise, &c., to terrify them. By the aid of tame elephants the wild ones are tied to trees, and after they have become somewhat dispirited they are led away between two tame ones, and put under the care of keepers, who gradually bring them into subjection. At first they are vicious and stubborn enough and require frequently to experience the unpleasant effects of the iron goad that their trainers use. The males are generally more unmanageable than the females; but those that are most violent and intractable at first are often the soonest to become docile and submissive. When fully tamed they become gentle and obedient, and in most cases are exceedingly fond of their keepers, and soon learn to distinguish the various tones of the human voice, as expressive of anger, approbation, or command. It is said, however, that the temper of a tame elephant is never to be implicitly relied on, as almost all of them are liable to fits of stubbornness and irritability. During the rutting season this animal is often seized with a madness which deprives him of all tractability, and renders him so dangerous that it is often necessary to kill him. The domesticated elephant requires much care, and a plentiful supply of food. He is liable to various diseases and ailments such as murrain, sores of the feet and skin, inflammation of the eyes, &c. The daily consumption of a working elephant is, according to Sir J. E. Tennent, 2 cwts. of green food and about half a bushel of grain. He must be led to the water twice or thrice a day to bathe. His daily consumption of water as drink is about 40 gallons. One singular fact in regard to the Ceylon elephant is worth mention, viz. that the body or skeleton of one that has died a natural death is hardly ever found. To account for this the natives affirm, that the elephants retire to a secret and inaccessible spot to die.

Elephants are employed in carrying burdens on their backs, and even with their mouths by means of a rope, the end of which they hold with their teeth. They load a boat with great rapidity and skill. In propelling wheel carriages upon a declivity they push them forward with their forehead, and support them with their knees. In dragging beams of wood along the ground they remove obstacles or elevate the ends of the beams so as to clear them. Before the invention of firearms they were used in war by many nations of antiquity; they are still employed in the East in dragging or carrying artillery. The structure of the elephant's ear was investigated by Sir Everard Home, and he came to the conclusion that the drum and every other part of the organ is much larger in proportion than in other quadrupeds or in man; and that there is a remarkable difference in the arrangement of the muscular fibres of the drum of its ear when compared with some quadrupeds

and the human species, a structure from which he concluded that the elephant has not a musical ear, but that it can hear sounds at a great distance. Sir Everard's conclusions have not been supported by others, however, and it is a well-known fact that the elephant is not insensible to the sound of music. The tusks of the elephant have long been applied, under the denomination of *ivory*, to a variety of important uses in the arts. From the fossil remains which have been discovered it is apparent that they must have been abundantly distributed over the earth in former times. (See MAMMOTH and MASTODON, and last plate at GEOLOGY.) The accounts given by writers of the intelligence of the elephant, although in many cases evidently exaggerated, still afford proof of a surprising degree of sagacity, and fully entitle him to the rank of

'The wisest of brutes, with gentle mind endowed;
Though powerful, not destructive.'

The African Elephant is distinguished from the Indian by its greater height, its larger ears, its more convex forehead, the closer approximation of the roots of the tusks, and the greater density of the bone. The back is concave not arched, and both sexes have formidable tusks. The dental laminae are also fewer and more sinuous on their margins.

ELEPHANT, ORDER OF THE, an ancient Danish order of chivalry. It is said to have been instituted about the end of the twelfth century by Canute VI. to perpetuate the memory of a Danish Crusader who had killed an elephant in the Holy Land. It was renewed by Christian I. in 1462, and placed on its present footing in 1693 by Christian V. It is the highest of the Danish orders. The bearers must be Lutherans, must have attained thirty years of age, except the princes of the royal family, who are admitted at the age of twenty, and must have been for at least eight days knights of the order of the Danebrog. The number of members, not counting those of the royal family, is restricted to thirty. Foreign sovereigns are excepted from these restrictions. The statutes of the order were renewed in 1808, and the knights of the Danebrog who receive the order of the Elephant must now wear their old decorations under the new. The fête of the order is held on the 1st of January, when the knights meet in the chapel of the order in the castle of Fredericksburg, taking rank by seniority upon seats over which are suspended their arms and devices. The insignia of the order are an enamelled white elephant, bearing on a blue housing, bordered with gold and crossed with white, a sculptured tower. This decoration is also borne on a blue ribbon worn as a scarf from right to left. A star with a white cross is worn on the left breast. On state occasions the elephant is worn attached to a chain composed of elephants and castles of gold, with a letter D in gold to represent *Dana* (Denmark). The device of the order is *Magni animi pretium*.

ELEPHANTA, or ELEPHANT ISLE, called by the natives *Charpur*, a small island in the Bay of Bombay, between Bombay and the mainland, 7 miles north-east of the former; circumference about 5 miles. It consists of two long hills and an intervening valley. It is chiefly overgrown with wood, but has a few inhabitants, who rear sheep and poultry for the Bombay market. It is celebrated for a cave temple 180 feet long, 123 broad, and 18 high, supported by pillars cut out in the rock. Many of these were cut down by the Portuguese. There are eight pillars or pilasters in a line from the north to the south and from the east to the west entrances. In the centre is a gigantic trimurti or three-formed god—Brahma the creator in the middle, with Vishnu the preserver on one side, and Siva the destroyer on the other. There are other

compartments containing other interesting sculptures; and also several other rock-caves. The date of these constructions is not known, but is supposed to be very remote. A large stone elephant which once stood near the landing-place gave its name to the island.

ELEPHANTIASIS, a disease so called from the legs of people affected with it growing scaly, rough, and wonderfully large, like the legs of an elephant. The disease may attack any part of the body, but usually the legs first. In its essence elephantiasis is a disease of the lymphatic system of vessels, accompanied by enormous overgrowth of the true skin and connective tissue. It begins with feverishness, sometimes high fever. The skin of the affected parts becomes swollen and reddened, often boggy and tender to pressure. Intense pain may be experienced in the small of the back, in the groins, and about the genital organs, where frequently enormous overgrowth occurs. After a few days the fever abates, and the evidences of the attack remain in the overgrowth and thickening of the parts attacked. After a variable interval the attack recurs, and renewed thickening of parts occurs, till the limb reaches an enormous size, the skin being rough, dark, thick, and scaly, resembling, as said, that of the elephant, and the seat, it may be, of weeping eruptions, or of ulcers in the folds. The progress of the disease may be slow, and without obvious involvement of the general health; and, in such cases, perhaps the chief inconvenience the patient experiences is the enormously bulky leg which he drags about with him. In other cases the rapidity of recurrence of the inflammatory symptoms, and their violence, produce great suffering and exhaustion, and may soon cause death. When the genital organs are attacked a tumour of enormous size, reaching even down to the knees, may be the result in time. Such tumours have been successfully removed by operation. Both sexes and all ages are liable to it; but men suffer more frequently than women. In the early stages removal of the person from the locality where the disease is endemic is the most satisfactory method of treatment. The disease is not contagious. It is believed that a parasite found in the blood of those suffering from it may have a casual relationship to it. It is common in hot climates—the West Indies, West Coast of Africa, India, China, Egypt, Arabia, and Barbados. It is, from the latter place, called Barbados leg. This disease must not be confounded with elephantiasis of the Greeks (*Elephantiasis Græcorum*), a kind of leprosy, in contradistinction to which Barbados leg is called *Elephantiasis Arabum* (elephantiasis of the Arabs).

ELEPHANTINE (Arabic, *Djeziret-cz-Zaher*, 'isle of flowers'), a small island in the Nile, opposite Assuan (Syene), remarkable for the ruins with which it is covered. The northern part is low, the southern elevated and rocky. The Nile for nearly a mile above is interrupted by numerous small rocks. The island is almost covered with ruins piled up on each other—Egyptian, Roman, Saracen, and Arabic. According to Murray's Handbook for Egypt, 'At the beginning of the present century there were the remains of two temples in Elephantine, one a very interesting one built by Amunoph III. They were destroyed in 1822 by the then governor of Assuan in order to obtain stone for building a palace. The greater part of the Nilometer which stood at the upper end of the island shared the same fate.' Among the remains going back to Roman times is a quay built of blocks mostly taken from older monuments. Many fragments of pottery with inscriptions in Greek have been found, some of these being receipts for taxes.

ELEPHANT'S FOOT (*Testudinaria elephantipes*),

a plant of the natural order Dioscoreaceæ (the yam family), distinguished by the form of its root-stock, which forms a nearly hemispherical mass rising a little above the ground, and is covered with a thick corky bark, divided by furrows, crossing each other at right angles, into sections resembling small pyramids. A slender climbing stem, sometimes 80 or 40 feet long, bears the organs of the plant. The root of the *Testudinaria* or *Tamus elephantipes* is used by the Hottentots for food, whence the name *Hottentot's Bread*.

ELEPHANT SHREW. See **SHREW**.

ELEUSINIAN MYSTERIES. See next article.

ELEUSIS, in ancient geography a town of Attica, about 12 miles north-west of Athens. It was chiefly distinguished for the celebration of the mysteries of Demeter (Ceres), Persephone (Proserpine), and Iacchus. Neither the founder of these mysteries nor the time of their origin is known, but they are thought to have been introduced from Crete. They were among the oldest and most venerated in Greece. It is said that when in the reign of Erechtheus Eleusis was subdued by the Athenians, the Eleusinians were allowed to retain the control of the mysteries; but this is a mere legend. At a subsequent period a temple was erected to Demeter, in Athens; but the original seat of the mysteries still continued to be regarded with special veneration, and the rites were afterwards celebrated partly there and partly at Athens. As a preparation for the greater mysteries celebrated at Athens and Eleusis, lesser Eleusinia were celebrated at Agræ on the Ilissus, beside Athens. These were held every year in the month Anthesterion (February—March), and consisted probably to a large extent of purifications, for which the water of the Ilissus was much used. They were held more especially in honour of Persephone, called Pherephatta here, than of Demeter. It appears that the carrying off of Persephone was the most important representation in these mysteries. . . . A great many, especially strangers, were initiated into these mysteries, who did not proceed to initiation into the regular Eleusinia' (Smith's Dict. of Gr. and Rom. Antiq.). These latter were also celebrated yearly, in the month Boedromion (September—October). They lasted for several days, beginning on the 15th of the month. Some time before the beginning of the mysteries a candidate for initiation went to be examined, and, if found fit, instructed, by one (called *mystagogus*) who had already passed through the ceremony of initiation and was familiar with the mystic rites. The first day of the annual celebration was occupied with the assembling at Athens of those intending to take part, and on the following day, the 16th of the month, the regular ceremonies began with what was called the *halade mystæ*, in which 'a proclamation was made . . . for the departure of all strangers and all murderers; and then the order for purification given, "Ye mystæ to the sea". The "sea" was sometimes the Piræus, . . . but generally the Rheitoi, two salt streams on the Sacred Road' (Smith). On the next day sacrifices were offered up at Athens for the safety of the state, and on the 18th the Epidauria, a supplementary sacrifice, was celebrated. On the 19th a procession started from the Eleusinium and proceeded to the Iacchæum, where they got the statue of Iacchus; and then passed slowly onwards to Eleusis. Many ceremonies were performed on the way, and on the morning after arrival sacrifices took place. On the nights of the 22nd and 23rd the initiated were led by the *mystagogus* through the dark into the lighted interior of the sanctuary, where the final mysteries were revealed. The ceremonies consisted in searching for Persephone with lamps, partaking of

a sort of sacrament or sacred potage, kissing relics, and the *plemochoe*, a sort of sacrifice to the dead. Games and theatrical exhibitions appear to have followed, and thereafter the people returned to Athens. The Eleusinian mysteries continued till the destruction of Eleusis by Alaric in A.D. 396. There is much that is obscure in our information regarding the mysteries, but they were generally supposed to have reference to the prospects of a future state, and the initiated were believed to be inspired with hopes of happiness in a life beyond the grave. See Bloch's *Der Kult und die Mysterien von Eleusis* (Hamburg, 1897).

ELEUTHERA, one of the largest of the Bahama Islands. It is of very irregular shape, and like most of the islands of the group long and narrow, its length being about 70 miles, and its breadth in general from 2 to 4, though in one part it is 10. Its chief production is pine-apples. Pop. over 7000.

ELEVATION, in the ritual of the mass, is the lifting up of the elements, immediately after consecration, to be worshipped by the people. It was introduced into the liturgy of the Latin Church in the eleventh century, in consequence of the heresy of Berengarius, which consisted in denying the real presence in the sacrament. The Council of Trent ordered that the host should be worshipped with the highest adoration, that of *latría*, which is offered to God only.

ELEVATION, in architectural drawing, is a vertical representation of any front or side of a building drawn without perspective, and according to a geometrical scale.

ELF. See **FAIRY**.

ELF-ARROWS, **ELF-BOLTS**, **ELF-SHOT**, are the names given to implements of stone (especially flint) of various sizes and forms, which are found abundantly in many countries, and are the remains of arrow-heads, darts, and other rude ancient weapons. They belong to the same class of ancient implements as are described in our article **CELTS** (stone hatchets). Stone arrow-heads are likely to have been used much later than such weapons as hatchets, because even after the use of bronze was introduced its high cost would prevent it from being applied to a purpose for which stone was nearly as suitable. These rude and ancient implements are objects of some extraordinary superstitions. The names given above are, of course, of popular and comparatively modern origin, and imply that those who gave them were completely ignorant of the real origin and use of those weapons. These names are found independently among the peasantry in Scotland, England, and Ireland, and the superstitions associated with them are much more widely spread. According to the popular belief the stones are of supernatural origin, and various virtues are attributed to them. They are worn as charms, and used as a protection against lightning; but they are chiefly suspected of mischievous consequences. When cattle take suddenly ill they are supposed to have been struck with them, and even men are said to be occasionally wounded by them. A cavern has been pointed out where the archfiend carries on the manufacture with the help of attendant imps, who rough-hew them while he finishes the work. Similar superstitions prevail in Italy, Africa, and Turkey. See Evans' *Ancient Stone Implements of Great Britain*.

ELGIN, also called **MORAY**, a northern maritime county of Scotland, bounded N. by the Moray Firth; E. and S.E. by Banffshire; S. by Inverness-shire; and W. by Nairnshire; area, 308,499 acres. Along the sea-coast the surface is flat, but inland it rises into hills of moderate elevation, intersected by fine and fertile valleys. The coast-line, which extends

upwards of 80 miles, presents, in the middle portion, bold precipitous rocks of sandstone, with a few detached masses, while the two extremities are for several miles formed of vast mounds and raised beaches of sand and gravel. Culbin Sands in the west form an arid waste where formerly was rich arable land. The chief rivers are the Spey, Lossie, and Findhorn, all remarkable for their romantic and picturesque scenery, particularly the Findhorn, in which, as in the Spey, there is good salmon-fishing. There are several lochs in the county, having fine scenery and abundance of excellent trout. The rocks in the south largely consist of granite, felspar, quartz, and mica-slate. Nearer the sea we find the Old Red Sandstone with fish remains, and a series of gray and yellow sandstones with reptilian remains, probably belonging to the Trias. Many quarries of freestone are worked, especially near the coast; otherwise the mineral productions are of little importance. The climate is noted for its general mildness, dryness, and salubrity. The soil on the low level tract of land which stretches along near the coast, with a breadth varying from 5 to 12 miles, is in general fertile and highly cultivated, the staple production being wheat. In other parts of the county oats are the chief crop. Barley, beans, pease, clover, grasses, potatoes, and turnips are also grown, but, excepting the last two, to no great extent. The great majority of farms are small, ranging from 50 to 100 acres, although they sometimes reach 500 acres. A great portion of the surface of the south and high lands consists of stretches of grouse moor and deer forest. About one-third of the total area is cultivated. Woods and plantations occupy about 49,000 acres. The exports from the county are corn, timber, whisky, and salmon. The county unites with Nairnshire in returning one member to the House of Commons. Principal towns and villages—Elgin, the county town, Forres, Forchabers, Burghhead, and Lossiemouth. Pop. (1891), 43,471; (1901), 44,808.

ELGIN, an ancient city, now a royal and parliamentary burgh, capital of the above county, on the Lossie, about 6 miles from its influx into the Moray Firth, 37 miles E. of Inverness, 70 N.W. of Aberdeen. It is pleasantly situated on a gently rising ground, and is surrounded by an amphitheatre of wooded heights. The High Street is a spacious well-paved street running east and west and about a mile long. A distinguishing feature of the town is the number of its elegant mansions and villas. The principal public buildings are the town-hall, a handsome building in the Scottish Renaissance style; the parish church, in the centre of the main street, a beautiful Grecian edifice, with a richly ornamented cupola and a Doric portico; the other churches (including a Roman Catholic and an Episcopal church), Gray's Hospital, the Elgin Institution, the academy, assembly-rooms, the city and county buildings, the Elgin Club, the New Club, the market buildings, the museum, Victoria School of Science and Art, the lunatic asylum, the Morayshire union poor-house, and the jail. The market-cross, destroyed in the eighteenth century, has been restored, and there are ruins of a castle. The most interesting architectural object in the town, however, is the cathedral, now in ruins, but once the most magnificent in Scotland. Of this venerable building, 'The Lanthorn of the North' as it was called, there remain some splendid fragments only. Its entire length was 282 feet by 86 feet broad, the transept was 115 feet in length, and the tower which rose from its centre, 198 feet high. Its foundation-stone was laid by Bishop Andrew de Moravia, July 19, 1224. It was plundered and burned in 1390 by the 'Wolf of Badenoch', Alexander

Stewart, son of Robert II.; and in 1568 its leaden roof was stripped off by order of the Regent Murray and his council, since which period it has gradually fallen into its present state of decay. It is now carefully preserved under the supervision of the Commissioners of Woods and Forests. Elgin has a literary and scientific association, with a museum rich in geology, natural history, and antiquities, a public library, &c. Brewing, distilling, iron-founding, coach-building, the manufacture of woollens, &c., are carried on, and there is considerable trade in grain, butter, and other farm produce. Elgin unites with Cullen, Banff, Peterhead, Kintore, and Inverurie (the Elgin burghs), in sending a member to the House of Commons. Pop. in 1891, 7799; in 1901, 8407.

ELGIN, JAMES BRUCE, EIGHTH EARL OF, and twelfth Earl of Kincardine, Governor-general of India, was the second son of Thomas, seventh earl, and was born in London 20th July, 1811. He was educated at Eton and Christ Church, Oxford, was first-class in Classics in 1832, and became a Fellow of Merton College. In 1841 he entered Parliament as member for Southampton, and in the same year he succeeded to the earldom. In 1842 he was appointed Governor of Jamaica. His rule in Jamaica was so successful that in 1846 he was appointed Governor-general of Canada, and there he succeeded by a conciliatory policy in allaying the discontent which had broken out and for some time continued. In 1849 he was raised to the British peerage as Baron Elgin of Elgin. In 1855 he returned to England, and was sent in 1857 as special ambassador to China, where in the following year he succeeded in concluding the Treaty of Tientsin. He also concluded a treaty with Japan by which several ports were opened to British trade. In 1859 he became a member of Lord Palmerston's cabinet, with the office of postmaster-general. In 1860, the Chinese emperor having manifested unfriendliness, Lord Elgin was sent to enforce the treaty, which he did by entering Peking in state and destroying the imperial summer palace. Immediately thereafter, in 1861, he was appointed to succeed Lord Canning as Governor-general of India. He maintained internal peace, and exerted himself unnecessarily for the internal development of the country. He died on 20th November, 1863, at a hamlet in the Himalayan passes called Dhurmsala, while engaged in a tour of inspection in the north of India.

ELGIN MARBLES, the name given to a splendid collection of antique sculptures which were brought from Athens to England by the seventh Earl of Elgin in 1814. They were afterwards purchased by the British Parliament for £35,000, and are now to be seen in the British Museum. The Elgin Marbles comprise some of the finest remains of ancient art, and offer the richest field for study. They are mostly from the Parthenon, and consist of figures in high and low relief and in the round, representing gods, goddesses, and heroes; the combat of the Centaurs and Lapithæ; the Panathenaic procession, &c. They exhibit Greek sculpture in its highest stage, and were partly the work of Phidias.

ELIAS. See **ELIJAH**.

ELIAS, MOUNT Str., one of the highest peaks of North America, 18,010 feet above sea-level. It stands near the west coast, on the line of demarcation between Canadian territory and the United States territory of Alaska, and is seen towering magnificently above a number of snow-clad peaks.

ELIJAH, the most distinguished of the prophets of Israel. His history is to be found in 1 Kings xvii. to xxi., and 2 Kings i. and ii. He flourished during the reigns of Ahab and Ahaziah, and until the beginning of the reign of Jehoram. He was especially

employed to denounce vengeance on the kings of Israel for their apostasy from the national faith, and many miraculous circumstances are recorded of his life. He incurred the anger of Jezebel, the wife of Ahab, for slaying the prophets of Baal and of the groves at the brook Kishon, and she instigated her husband to put him to death; but Elijah fled to Horeb, where he received a divine manifestation, and afterwards returning to Samaria denounced the vengeance of God against Ahab for the murder of Naboth and the usurpation of his vineyard. Elijah was at length taken up to heaven in the presence of Elisha, his successor, who saw him ascend in a chariot of fire (2 Kings ii.). This event occurred, according to Ussher, B.C. 896.

ELIOT, GEORGE, the assumed literary name of Mary Ann, or, as she preferred to write the name in later years, Marian Evans, one of the greatest novelists of the nineteenth century. She was the daughter of a Warwickshire land agent, and was born at Arbury farm, near Nuneaton, on 22nd November, 1819. She received her early education at Attleborough, Nuneaton, and Coventry, and sooner or later, either under the tuition of masters or by teaching herself, she acquired a knowledge of Greek, Latin, French, German, and Italian; she also studied Hebrew, and for some time devoted herself to the study of music, becoming an excellent piano player. She was also a constant and omnivorous reader. Shortly after her twenty-first year she came into personal contact with friends who held rationalistic views in regard to religious matters, and though previously she had been attached to the doctrines of the evangelical school (she had an aunt a Methodist preacher), her religious views now underwent such a change as to cause a breach between her and her father which seems never to have been entirely closed up. Her first literary undertaking was the continuation of a translation of Strauss's *Life of Jesus*, commenced by her friend Mrs. Hennell, and completed by our authoress in 1846. In 1849 she went abroad, returning to England next year, and in 1851 she took up her abode as a boarder in the house of John Chapman, editor of the *Westminster Review*. This connection led to her being attached to that periodical as sub-editor. Various articles in the *Review* from 1852 onwards have been attributed to her, but her principal work appears to have been the writing of the summaries of contemporary literature. It was not, however, until January, 1857, that she came prominently into public notice, when the first of a series of tales entitled *Scenes from Clerical Life* appeared in Blackwood's Magazine. These tales immediately arrested attention, and obtained the praise of the editor, who was informed that he was to know the author as George Eliot. Mr. John Blackwood was as ignorant of the author's identity for a considerable time as was all the world except Mr. G. H. Lewes and one or two others. The *Scenes* came to an end in November, 1857, and in the February following, the first chapters of *Adam Bede* were in the publisher's hands, the whole work being completed and sent in by October. The success which attended the publication of this powerful story of English rural life was unmistakable, and public curiosity was greatly excited as to the personality of the author. The credit of authorship was openly ascribed to various persons of more or less note and was claimed by others of more or less modesty and honesty. The secret soon began to leak out. Months before her second novel, *The Mill on the Floss*, was published (1860) it was well known, among literary circles at least, that George Eliot was none other than Marian Evans, the *Westminster Reviewer*. By this time was established that close association and literary

fellowship with the talented philosophical writer, George H. Lewes, which terminated only with the death of the latter but a little more than two years before her own. In 1861 was published *Silas Marner*, another story of humble country life, a painful, but powerful and interesting tale. Two years later she gave to the world *Romola*, an historical novel of Italian life in the time of Savonarola, which is considered by a select few as her greatest intellectual achievement. This was followed by *Felix Holt*, a story dealing with political, social, and religious peculiarities (1866); *Middlemarch*, somewhat weak and diffuse as a story, but replete with pregnant thought and clear delineation of character (1871); and *Daniel Deronda*, containing some striking and original sketches of Jewish life and character (1876). Previous to this she had acquired some renown as a poetess through the publication of several volumes of poems, among which may be mentioned *The Spanish Gypsy* (1868), *Agatha* (1869), and *The Legend of Jubal* (1874). Her last work was a series of essays, entitled *The Impressions of Theophrastus Such* (1879). In May, 1880, she married Mr John Cross, but died rather suddenly at Chelsea on the 22d of December of that year. Her *Life*, as unfolded in her *Letters and Journals*, was published in 1885 by her husband.

ELIS, a country in the west of the Peloponnese, where *Olympia* was situated. (See **OLYMPIC GAMES**.) It was bounded on the east by *Arcadia*, on the south by *Messenia*, and ran along the coast, watered by the river *Alpheus*. *Elis* was the capital of the country.

ELISION, a term used in grammar to designate the cutting off of a short vowel at the end of a word when the following word begins with a vowel, for the purpose of avoiding the *hiatus*. In some languages, to mark where the elision takes place, an apostrophe is inserted. The elision occurs frequently in poetical language or versification, and more especially in Greek and Roman poets, who were wont in this way to cut off even diphthongs.

ELIXIR (from the Arabic), the word originally applied by the alchemists to the philosopher's stone, and to certain other preparations, for instance, corrosive sublimate. It is now the name of several medicines consisting of wine, or spirits of wine, and various resinous, bitter, vegetable substances. The word, however, is almost gone out of use, and its place supplied by *tincture*. Elixirs, indeed, differ from tinctures by having a thicker and more opaque consistence, and by containing less spirit. The stomach elixirs of *Frederic Hoffmann* and *Stoughton* are well known. The former is prepared by dissolving in *Malaga* or *Hungary* wine the extract of cardamoms, orange-peel, canella, myrrh, and adding to the solution a little tincture of cloves and of saffron. *Stoughton's* elixir consists of *absinth*, gentian, *rhubarb*, *cas-carilla*, and orange-peel, steeped in spirits of wine.

Paregoric elixir, a popular remedy for cough, contains opium, benzoic acid, camphor, oil of anise, dissolved in spirit and strained. *Scotch paregoric* omits camphor and adds saffron and strong ammonia, the proportions being besides different. *Elixir of vitriol* consists of cinnamon, ginger, spirit and sulphuric acid macerated for a week and strained; and a mixture of a large number of aromatic substances, with sugar, spirit, and sulphuric acid digested for three weeks constitutes *Mynsdicht's* elixir.

ELIZABETGRAD, a fortified town, Russia, in the government and 180 miles N. by W. of Kherson, in a plain on the *Ingul*. It consists of the town proper, built with the greatest regularity in spacious streets, occasionally lined with trees; of four suburbs, and of the citadel, surrounded by six bastions. The military colonies on this side of the Bug have their headquarters here. Pop. (1897), 61,841.

ELIZABETH, Queen of England, one of the greatest sovereigns of modern times, was the daughter of *Henry VIII.* and of *Anne Boleyn*. She was born at *Greenwich*, 7th September, 1533, and almost immediately declared heiress to the crown. After her mother had been beheaded (1536) both she and her sister *Mary* were declared bastards (28 *Henry VIII.* cap. vii.); finally she was placed after *Prince Edward* and the *Lady Mary* in the order of succession (35 *Henry VIII.* cap. i.). Thus, while the first two marriages of *King Henry* were both still held to be illegal, the children of both were legitimized. Elizabeth received a classical education, as was customary with females of rank in her time, and under her tutor *Roger Ascham* she is said to have attained very considerable proficiency in Latin and Greek. During her father's life, as well as in the reign of her brother, various negotiations were entered into for her marriage. The *Duke d'Angoulême* and *Philip of Spain*, who afterwards married her sister, were among the matches proposed for her; but the only affair of this kind in which she may be supposed to have been personally interested was the suit of *Lord Seymour of Sudley*, the *Protector Somerset's* brother. It is certain that even during the life of *Catharine Parr*, the widow of *Henry VIII.*, whom he married, the familiarities in which he indulged with the *Lady Elizabeth* were only too well encouraged. Both before this marriage and after the death of his wife he was a suitor for the hand of the princess; but his ambitious designs in this and other matters were not countenanced by the council, and ultimately cost him his life.

On the death of *King Edward* Elizabeth vigorously supported the title of *Queen Mary* against the pretensions of *Lady Jane Grey*, by which her own title as well as her sister's were barred. She rode to meet her sister, accompanied by 1000 horse, and this bold proceeding was of no small service in confirming the doubtful in their allegiance; but favours from rivals are proverbially ill received, and Elizabeth gained little for herself by a policy in which it was well understood she had her own interest in view. After *Wyatt's* conspiracy her life was in great danger, and was probably only saved by the intercession of *Philip*, who had not the rancorous jealousy of her sister. She was committed to the Tower, from whence she was removed to *Woodstock*, where she was confined with great strictness. She afterwards, through *Philip's* intercession, obtained greater liberty; but throughout the whole reign she continued an object of suspicion and surveillance. The danger she now incurred developed a trait in her character which ever after continued conspicuous, her power of dissimulation. She made every demonstration not only of conformity, but of zealous adherence to the established religion. She opened a chapel in her house; entertained Roman Catholic priests; kept a large crucifix suspended in her chamber; worked garments for saints; and accompanied the queen in her religious professions. Her conduct in this must not be judged from the point of view of rigid Protestantism, which Elizabeth never professed; but there were some at least among the Catholic ceremonies and customs to which she could not be supposed to give a sincere adherence. Nevertheless, her false zeal must have been well and ably sustained, for her conduct was not left to the report of friends, but carefully watched by spies and informers. It is remarkable that at this period, when her life was constantly in danger, Elizabeth did not rescue herself from the power of her sister by a marriage with a foreign prince. It was from no want of suitors that she failed to avail herself of this resource. *Philip* was most anxious to have her mar-

ried out of the kingdom; and if the Duke of Savoy, whom he proposed, was unacceptable from his Catholicism, there was Eric, son of the King of Sweden, who long after continued to press his suit; but Elizabeth refused both. The fact is, she felt in herself a capacity for rule, and her sister's health opened up for her an early prospect of the throne, which she was unwilling to peril. Mary's reign was not without advantage to Elizabeth. It tried her councillors as well as herself, and gave her the opportunity of selecting them to advantage. Her adviser throughout the whole of it was William Cecil, afterwards Lord Burleigh, who had already been a minister under Edward VI., and continued for the rest of his life to be one of the chief councillors and most able ministers of Elizabeth, to whom he was in many respects a congenial spirit.

On the 17th of November, 1558, Mary's disastrous reign came to a close. Elizabeth was immediately recognized queen by Parliament. In her first public appearances she showed how well she had studied the art of winning the hearts of the people, but her sister's severities had rendered her pains almost superfluous, and the great sense of relief from an almost intolerable oppression rendered her accession one of the most joyous on record. On entering London she was met by the bishops, whom she permitted to kiss her hand, with the exception of Bonner, 'whom she omitted for sundry severities in the time of his authority.' It was now that the caution and secrecy characteristic equally of Elizabeth and Cecil, and which enabled them to do such great things, appeared in spontaneous exercise. The Catholic religion was still predominant in the House of Lords, and any attempt to overthrow it suddenly might have been attended with the greatest danger. Elizabeth made no immediate change in her habits. For a full month the ceremonies of the Roman Church were retained in all their state. A solemn funeral service was held for Queen Mary in Westminster Abbey, at her interment on 13th December. On the 24th a similar service was held there for Charles V. The queen even intimated her accession to the pope. In private she allowed herself a little relaxation of her bonds. On Christmas-day, when the bishop was preparing to say mass in her great closet, she retired with her nobles after the Gospel was done. She retained the greater part of her sister's council, choosing only seven new councillors, who were Protestants, it is true, but who were not then known as such. Like Cecil and herself, they had all conformed, and possessed the necessary qualification for Elizabethan councillors of accomplished hypocrisy. Such were her difficulties, notwithstanding her great prudence, that at her coronation, which was conducted according to the Roman ceremonial, only one of all the bishops, Oglethorpe of Carlisle, could be found to set the crown on her head. The obstacle, it is said, was her refusal to permit the elevation of the host. She had also before this authorized the reading of the liturgy in English. The first great object of her reign was the settlement of religion. A Parliament was immediately called, to which this work was assigned. The Parliament met on 25th January, and was dissolved on the 8th May, but its object was already accomplished. The nation was prepared for a return to the reformed faith, and the Parliament was at the bidding of the court. The reformation of religion in England was the work of Cranmer, and had already been accomplished in the reign of Edward VI.; the re-establishment of the ecclesiastical system of the national church on the basis on which it has remained to the present day was the work of Cecil and Elizabeth, and it was nearly com-

pleted in this Parliament. The differences between the first and the second reformation were, generally, as respects the latter, in a retrograde direction. Elizabeth had less extreme opinions than many supporters of the new faith. She was tolerant, for instance, in regard to images, and is said to have entertained scruples as to the extent of the royal supremacy in spiritual matters; but if she did, they must have been purely speculative. They certainly vanished on the first taste of power.

If the formal establishment of the reformed religion was easily completed, the security and defence of the settlement was the main object of the policy and the chief source of all the struggles and contentions of her reign. What made the position so difficult was the intolerance by which at this period and for long after all religious sects were characterized. No sooner were the Puritans freed from the oppressive tyranny of Mary's reign than they began to claim predominance for their own dogmas. But it was far from the intention of the queen and the supporters of the Established Church, notwithstanding the common persecutions they had endured, to grant them even liberty of worship. Elizabeth's own determination, as expressed by herself, was that none should be allowed to turn aside either to the right hand or the left from the drawn line of prescribed duty, and in insisting upon uniformity of worship she was not singular, but was acting in the spirit of her age. This principle was not less firmly held in her reign than in her sister's, however the penalties for infringing it may have been modified; and the Catholics on the one hand, and the Puritans on the other, restrained only by their dread and hatred of each other, were made the irreconcilable enemies of the existing order. Moreover, from the necessities of the struggle the severities of Elizabeth's reign went on increasing as time advanced. At first no one suffered death for his opinions; but latterly, under various pretexts, many were put to death, chiefly for religion. Eventually, on one occasion, in 1576, the writ of *De Hæretico Comburendo* was revived, and two foreigners, in spite of an earnest appeal addressed to the queen by John Fox, the martyrologist, were consigned to the flames of Smithfield. The struggle against the Catholics was the most severe, chiefly because they were supported by foreign powers; so that while their religion was wholly prohibited, even exile was forbidden them in order to prevent their intrigues abroad. Many Catholics, particularly priests, suffered death during this reign. Simple nonconformity, from whatever cause, was pursued with the severest penalties. The fine imposed for non-attendance at church was £20 per month (Act of 1581), while so strict were the lines of conformity drawn, that many more clergymen were driven out of the church by differences about the position of altars, the wearing of caps, and such like matters, than were forced to resign by the change from Rome to Reformation. These stringent measures were, however, the rigid consequences of the false position assumed.

Elizabeth's first Parliament approached her on a subject which, next to religion, was the chief trouble of her reign, the succession to the crown: they requested her to marry. She replied in a long speech, declaring her intention to live and die a virgin. It is certain, from her conduct both before and after, that this declaration was only a convenient affectation of prudery, which at once served to flatter her vanity and to veil her real indecision. Elizabeth had all the susceptibility with more than the ambition of a woman. She saw too clearly for her own interest the restraints to which each particular marriage might subject her, and therefore, with obvious hesitation on more than one occasion, she shunned them

all; but in doing so she left the painful question of the succession open, which caused her more sorrow than almost the worst marriage could have done. Her wisest course would probably have been to have elevated some feeble favourite, over whom she might easily have retained her influence, to the throne. At this very time she had a proposal from the infatuated Philip. It was impossible she could have accepted him; but her dissimulation, which led her to make capital of everything, would not permit her to give him a direct refusal.

The love of power which kept her from marriage inspired in Elizabeth the most furious jealousy of all pretenders to the English succession, and led her into crimes which her otherwise mild and benignant disposition would have shunned. The ladies Catharine and Mary Grey felt her vengeance for the simple crime of marrying; although the latter, purposely to disarm her, had chosen a husband of no rank. Both were imprisoned till their death, while the Lieutenant of the Tower was dismissed for permitting the husband of the former, the Earl of Hertford, to have access to her. Such actions might have rested in obscurity, but Elizabeth had a rival more illustrious who caused her far other anxieties, and her treatment of whom cast the deepest stain upon her reign, the unfortunate Mary, queen of Scots. The story of Mary's fate is mixed up with the political events of Elizabeth's reign, of which the briefest notice must suffice. On her accession the country was at war with France. Peace was easily concluded (1559); but the assumption by Francis and Mary of the royal arms and titles of England led to an immediate interference on the part of Elizabeth in the affairs of Scotland. She entered into a league with the Lords of the Congregation, or leaders of the Reformed party; and throughout her reign this party became distinctively an English one, and was frequently serviceable in furthering her policy. She also gave early support to the Huguenot party in France, and to the Protestants in the Netherlands, so that throughout Europe she was looked on as the head of the Protestant party. This policy roused the implacable resentment of Philip, who strove in turn to excite the Catholics against her, both in her own dominions and in Scotland. After the detention of Mary in England, a measure dictated rather by jealousy than by the usual good policy of Elizabeth, he fomented the various rebellions in her favour formed in England and Ireland, and at her death declared himself her avenger. Mary, as is well known, was imprisoned nineteen years in England, whither she fled to the protection of Elizabeth. Her imprisonment was followed by a series of conspiracies, beginning with that under the Earls of Northumberland and Westmoreland, and ending with the plot of Babington, which finally determined Elizabeth to make away with her captive. The execution of Queen Mary was, nevertheless, the chief political blunder of Elizabeth's reign. The duplicity with which it was contrived, and Elizabeth's unscrupulous severity to her instrument Davison, have deprived the deed of any possible justification. If the death of Mary did not raise up new enemies to Elizabeth on the Continent it at least gave a just cause of scandal to those she already had, and it was no small attainment in bad policy to shock the master of Alva and the authors of the St. Bartholomew. To return for a moment to the last event, the news of the massacre of St. Bartholomew was received in England with horror. It did not, perhaps, excite quite so much in the court. Shortly after it occurred Walsingham sent his secretary to thank the king and Catharine de Medicis for the great care it had pleased them to have of the English during the late tumult. Eliza-

beth had for some time been engaged in a negotiation for marriage with the Duke d'Alençon (afterwards d'Anjou); the negotiation was still carried on, and was ultimately nearly successful. In 1580 the duke arrived in London to pursue his suit, which had lasted nearly ten years, in person. He was well received, but still the queen hesitated. It is said she wept because her council were less prompt in advising her to marry than formerly. She was now forty-seven. The following winter the duke paid another visit, and the marriage was all but concluded. But prudence prevailed, and she finally informed him she could never marry.

The state of France, as indicated by the change of government consequent on the accession of Henry IV., who was assisted by Elizabeth, obviated any danger that might have arisen from the indignation which the execution of Queen Mary had caused in that country. Nowhere, however, was that event more meekly borne than by King James. The Scottish Solomon had thought his mother's danger a favourable opportunity for sententious observations about the strangeness of her case, and now his philosophy was nonplussed. His awe of Elizabeth and his dread of interfering with his own right of succession to England made him powerless, and he accepted an addition to his pension in full of all grievances. Philip was not to be so appeased. He had other grievances, to which the execution of Mary lent edge. The fleets of Elizabeth had galled him in the West Indies, her arms and subsidies had helped to deprive him of the Netherlands; the Armada was already in preparation. Therefore he called the Queen of England a murderess, and refused to be satisfied even with the sacrifice she seemed prepared to make of her Dutch allies. The Armada sailed on 29th May, 1588. Its fate is too well known to need recapitulation. The war with Spain dragged on till the close of Elizabeth's reign.

During her long reign Elizabeth showed her judgment in nothing so much as in the councillors she trusted. But while the splendour of her government at home and abroad was sustained by such men as Burleigh, Bacon, Walsingham, Throgmorton, and the unfortunate Davison, who served her with a zeal which did not always spare even their own reputations, she had personal favourites of less merit who were often more brilliantly rewarded. It is sufficient to name Dudley, whom she created Earl of Leicester, offered as a husband to Mary, and would perhaps have gladly taken as her own; and Essex, who was still more a personal favourite, though much less a courtier. The latter had some merit as a soldier; but his violent temper, ill-suited to the queen's haughty disposition, brought about his ruin. He was beheaded in 1601, and Elizabeth never forgave herself his death. Her own health soon after gave way, and she died on 24th March, 1603, naming James of Scotland as her successor.

Besides its political glories, the reign of Elizabeth was the golden age of English literature. If all else could be forgotten, it would be remembered as the age of Spenser and of Shakspeare, not to mention a host of minor names. The naval achievements of Drake and the discoveries of Raleigh occurred to do it honour. Thus everything conspired to throw a halo round the name of Elizabeth, when regarded as a sovereign, and seen as she would be in her own day, especially by foreign beholders, through the drapery of state. If a minute criticism has exposed some of the weakness of the individual woman who bore this burden, it must be remembered that the process is only half fair. As a sovereign she is entitled to her surroundings, and as an absolute ruler, as to a great extent she undoubtedly was,

she must have her share of praise for the good that was done in her name. It is no small merit to select good councillors and to adhere to them. Elizabeth knew how to do both; and yet she was no puppet in the hands of her advisers. Though haughty and imperious to the Commons, she knew both when and how to yield. She studied with rare sagacity the temper of the people; and high as were her notions of prerogative, she may fairly be considered the first constitutional monarch of England.

ELIZABETH (formerly *Elisabethtown*), a city, capital of Union county, New York, United States, 14 miles s.w. from New York, with which it has ample communication by railway and steamer. It is beautifully situated in a fertile country, and has many fine paved streets. The public buildings include about 25 churches, court-house, city-hall, a number of excellent schools, charitable and other institutions. The Singer Sewing Machine Co. has a large factory, and there are foundries, oil-cloth factories, &c. Pop. (1890), 37,764; (1900), 52,130.

ELIZABETH, *St.*, of Thuringia, distinguished for her piety and virtue, the daughter of Andreas II., king of Hungary, was born at Presburg 1207, and in 1221 was married to Louis, landgrave of Thuringia, to whom she had been betrothed at four years of age. While the husband devoted himself to knightly exploits, the wife was distinguished by the mild virtues of her sex. When Germany, and especially Thuringia, was oppressed with famine and pestilence, she caused many hospitals to be erected, fed a multitude of the poor from her own table, and supplied their wants with money and clothing. She wandered about in a humble dress, relieving the sorrows of the wretched. Louis died on a crusade, and her own life terminated November 19, 1231, in an hospital which she had herself established. She was regarded as a saint by her admiring contemporaries, and four years after her death this canonization was approved by Pope Gregory IX. A beautiful church and a costly monument were erected over her tomb. The latter is now one of the most splendid remains of Gothic architecture in Germany.

ELIZABETHAN ARCHITECTURE, a style of architecture which began to prevail in England during the reigns of Elizabeth and James I. It succeeded to the Tudor style, properly so called, with which it is sometimes confounded. The Elizabethan style was a mixture of the Gothic with the Italian, often very picturesque, but without purity and unity of design. It was characterized by deeply embayed windows and galleries of great length. It was chiefly exemplified in the mansions of the nobility.

ELIZABETH PETROWNA, Empress of Russia, was the daughter of Peter the Great and Catharine. She was born in 1709 or 1710, and ascended the throne on 7th December, 1741, as the result of a conspiracy, in which Ivan VI., a minor, who had reigned only one year, was deposed. This conspiracy was also a reaction of the old Russian party against the reforming policy introduced by Peter I., and the influence of strangers on the internal government of Russia. Elizabeth is said to have rivalled her mother in beauty, and to have surpassed her in her love of pleasure. Her reign was stained both by her unbridled licentiousness and the tyranny of her government, which was conducted by favourites. Banishment to the mines of Siberia and imprisonment in dungeons was awarded for the slightest political offences. She was a patron of literature, and corresponded with Voltaire, to whom she supplied materials for his life of Peter the Great. She also founded the University of Moscow and the Academy of Fine Arts of St. Petersburg. Besides her numerous avowed lovers, she had a secret marriage with

a Russian of low rank, but handsome appearance. During her reign Russia was engaged in several wars. The first, with Sweden, in 1743, was speedily and advantageously concluded by the Peace of Abo. Elizabeth afterwards sent an army, in 1745, to assist Maria Theresa in the war of the Succession, which contributed to bring about the Peace of Aix-la-Chapelle; and she joined in the Seven Years' war against Prussia, animated by hatred of Frederick II., some disparaging remarks made of her by Frederick having been reported to her for the purpose of exciting her enmity. She died in 1762, before this war was concluded.

ELIZABETH STUART, Queen of Bohemia, daughter of James I. of England and VI. of Scotland, was born in Falkland Palace, Fifeshire, on 16th August, 1596. A marriage was contracted between her and the Palatine Frederick, and celebrated with great pomp at Whitehall on 14th February, 1613. Her husband was then at the head of the Protestant interest in Germany, and in 1619 he accepted the crown of Bohemia offered to him by the revolted Protestants of that country. This he was only able to retain for a very short period; and after his defeat by the imperialists at the battle of Prague, on 8th November, 1620, he and his wife were obliged to flee, first to Breslau and Berlin, and then to the Hague. Elizabeth had thirteen children, several of whom died early. Charles Louis, the eldest surviving, was reinstated in the palatinate by the Treaty of Westphalia in 1648. His daughter, Elizabeth Charlotte, was the second wife of Philip, duke of Orleans, brother of Louis XIV. Her descendants were excluded by their Catholicism from the crown of England, but one of them was regent of France during the minority of Louis XV.; and another, Louis Philippe, ascended the throne after the revolution of 1830. Her sons Princes Rupert and Maurice distinguished themselves in the civil war in England. Her daughter Sophia, married into the house of Brunswick, became Electress of Hanover, and mother of George I. Elizabeth Stuart's cause was extremely popular with the English nation, and after her husband was deprived of the crown of Bohemia she still retained among them the endearing epithet of 'Queen of Hearts.' She returned to England at the Restoration with her nephew Charles II., and died at Leicester House, London, on 13th February, 1662.

ELK. See *DEER*.

ELL (Latin, *ulna*, the fore-arm), a measure which obtains, under different denominations, in most countries, whereby cloths, stuffs, linens, silks, &c., are measured. The ell English is 5 quarters, or 45 inches; the ell Flemish, 3 quarters, or 27 inches. In Scotland an ell contained 37·2 inches English.

ELLAGIC ACID, or **BEZOARDIC ACID**, is separated from oriental bezoars by dissolving them in cold strong potash, away from the air, passing a current of carbonic acid, collecting the ellaginate of potassium, washing and recrystallizing it, and then liberating the ellagic acid by hydrochloric acid. It is insoluble in water, but dissolves in alcohol. It is a pale yellow, tasteless, crystalline powder, decomposed on heating. With the bases it forms salts, which are not very well known; they are crystalline, and insoluble or sparingly soluble in water. The lead and barium compounds are yellow. This acid can also be obtained from gallic acid, of which it is a product of oxidation. It was from this source that it was first got by Chevreul; it was afterwards identified by Wohler with that from bezoars. It appears to be doubtful whether it occurs ready formed in gall-nuts, or whether it is produced in the process of extraction.

ELLENBOROUGH, **EDWARD LAW**, Lord Chief-justice of the King's-bench, was born in 1750,

at Great Salkeld, in Cumberland. His father, Dr. Edmund Law, bishop of Carlisle, placed him at the Charter House, London, in 1762. He entered the University of Cambridge in 1768. He entered Lincoln's Inn in 1769, graduated B.A. in the university in 1771, and was called to the bar in 1780. By the patronage of Sir Francis Buller, one of the judges of the King's-bench, he early obtained a silk gown. On the trial of Warren Hastings, in 1785, Erskine having refused to undertake the defence, Law served as leading counsel. It required no little courage to encounter such opponents as Burke, Fox, Sheridan, and other eminent men of the time, who conducted the impeachment. Law was assisted by Plomer and Dallas, and, as is well known, obtained the victory. (See HASTINGS.) The defence did not come on until the fifth year of the trial. To the brilliant eloquence of his adversaries Law opposed simple, logical, and clear statements. After eight years, in which the trial had occupied 148 days, at an expense of £71,080, Hastings was acquitted. Law's success was now certain. In 1801 he was made attorney-general, and in 1802, on the death of Lord Kenyon, he became Lord Chief-justice of the King's-bench, and was created baron. He adopted the title Ellenborough from a small fishing village of that name, where his ancestors had lived for a long time. Under Lord Grenville's administration he became a member of the privy-council (1806), which by many is considered as unconstitutional. In Parliament he was opposed to the emancipation of the Catholics. He held the office of chief-justice for fifteen years, when his health sank under the duties of the office. He resigned his office in 1818. He died in December of the same year, at the age of seventy years. Lord Ellenborough enjoys a high reputation for legal ability.

ELLENBOROUGH, EDWARD LAW, FIRST EARL OR, the son of Lord Chief-justice Ellenborough, was born 8th September, 1790. He was educated at Eton and St. John's College, Cambridge, where he took the degree of M.A. in 1809. He entered Parliament as representative of St. Michael's in 1814, and in 1818, having succeeded his father as second baron, he entered the House of Lords. He first took office in 1818 as lord privy-seal under the Duke of Wellington. He became president of the board of control in 1828, which office he held till the fall of the ministry in 1830, and resumed in 1834 under Sir Robert Peel. When Peel became prime minister again in 1841 he resumed his post, but in a short time accepted the governor-generalship of India. He arrived in Calcutta in February, 1842, in time to take the control of the Afghan war, which, under the conduct of Generals Pollock and Nott, was brought to a successful issue. Scinde was conquered by Sir Charles Napier, and annexed in 1843. This was followed by the conquest of Gwalior. The conduct of the governor-general, however, had given great dissatisfaction at home. His policy at first had been vacillating, and latterly too warlike, and the vanity and indiscretion of his proclamations, particularly that referring to the gates of Somnauth, were looked upon as seriously impugning the soundness of his judgment. He was consequently recalled by the East India Company early in 1844. On his return, however, he was defended by the Duke of Wellington, received the thanks of Parliament, was created an earl, and decorated with the Grand Cross of the Bath. He held the post of first lord of the admiralty from the end of 1845 to June, 1846, and under Lord Derby's government in 1858 held the office of president of the board of control from February to June, during which he wrote a despatch censuring the policy of Lord Canning as governor-general of India, which caused much discussion, and led him to resign his office.

He did not again resume office, but continued to take an active part in the proceedings of the House of Lords. He died 22d December, 1871.

ELLER, JOHANN THEODOR, of Brockenhausen, was born Nov. 29 (o.s.), 1689, at Plötzkau, in Anhalt-Bernburg. Of a wealthy family, he received an excellent education, studied law at Quedlinburg and Jena, and then natural science and medicine at Halle, Leyden, and Amsterdam. After spending some time at the mines of Saxony and the Hartz, he went to Paris, continued his study of anatomy, and acquired chemistry under Lemery, Homberg, and other French teachers. Then he went to London, and on his return to Germany in 1721 was appointed Anhalt-Bernburg physician; in 1724, professor of anatomy in Berlin; 1736, physician to Frederic the Great; 1755, privy-councillor and director of the physical class of the Academy of Sciences. He died at Berlin, Sept. 18, 1760.

Eller did not contribute much directly to the science of chemistry, and in general took the side of opinions which were ultimately proved incorrect. He was a follower of Stahl, sought to prove that water can be converted into earth, and that the bulk of water is not altered when salts dissolve in it. On these and other points he entered into a controversy with his contemporary Pott, and Eller in particular has been blamed for the violence and private personalities which he introduced into it. His papers were published in the *Memoirs of the Berlin Academy*, and among them is a long and interesting review of the opinions held respecting the elements from the earliest times down to his own day. He also published a series of curious microscopic observations upon the change of blood corpuscles by the addition of different salts, tinctures of plants, and other solutions. Eller was undoubtedly a man of great learning and abilities, but his writings do not indicate a high degree of originality.

ELLERLIANS, a sect of fanatics which arose in 1726, and had for its founder Elias Eller, a ribbon-weaver, who was born in 1690 at Ronsdorf in Berg, and appears to have lost his senses by reading the works of Jacob Böhme, and other mystical writings. The sect committed great excesses, and became very numerous.

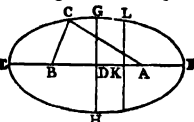
ELLICE ISLANDS, in the South Pacific, consist of several groups of coral islands situated between 5° and 11° s. lat., and 176° and 180° e. lon.; pop. 8000. The inhabitants of these islands are Polynesians, who have mostly accepted Christianity. The only produce exported is copra. The islands belong to Britain.

ELLIOT, GEORGE AUGUSTUS. See HEATHFIELD.

ELLIOTT, EBENEZER, the 'Corn-law Rhymer,' was born on 17th March, 1781, at the New Foundry, Maasborough, near Rotherham, Yorkshire. His father was a clerk at the foundry, a member of the Besean sect, a Calvinist of the strictest order, and a rabid democrat in politics. He was very poor, and had a large family to support. When a boy Ebenezer was noted for dullness, and he seemed at first inclined to be rather idle and dissipated in his habits, but he was rescued from this danger by the love of nature, and having acquired a taste for the study of botany he began to apply himself to self-education. At the age of seventeen he published his first poem, the *Vernal Walk*, which was soon after followed by some others. At this time he was engaged in his father's foundry. He afterwards married and commenced business, in which he did not succeed. He attributed his failure to political causes, and his animosity was particularly directed against the corn-laws. From 1831 to 1837 he carried on business with greater success as an iron merchant in Sheffield. Soon after coming here he began his corn-law rhymes in a local

paper. They were continued periodically, and soon attracted attention. Though rugged in diction, and harsh, and even savage in many of the thoughts to which they give utterance, they are nevertheless the genuine outpouring of a poetic soul burning with a sense of the oppressions to which, as he believed, a blind and selfish policy subjected his poorer brethren. They were afterwards collected and published in a single volume, with a longer poem entitled *The Ranter*. In 1829 appeared the *Village Patriarch*, the best of Elliott's larger pieces; and in 1834 he published a collected edition of his works in three volumes. These included many beautiful little pieces descriptive of Yorkshire scenery—the result of his early rambles in the fields and woods. Commercial losses compelled him in 1837 to contract his sphere of business, and in 1841 he retired from it altogether, taking up his abode at Great Houghton, near Barnsley, where he died on 1st December, 1849. Various contributions from his pen had appeared from time to time in the newspapers, and in *Tait's Magazine* since 1834; and in 1850, after his death, a posthumous collection of his writings in two volumes was published under the title of *More Prose and Verse by the Corn-law Rhymers*.

ELLIPSE, in mathematics, one of the conic sections. (See **CONIC**.) Kepler discovered that the planets describe such a curve in revolving about the sun. It presents to the eye at once variety and regularity, and is therefore preferred by painters to the circle for the outline of their pictures. Two points in the longest diameter have this peculiarity: the sum of two straight lines drawn from them to any point in the circumference is always the same to whatever point they are drawn. On this is founded the usual method of describing an ellipse. At a given distance on the plane on which the ellipse is to be described fix two pins, A and B, and pass a string, A B C, round them. Keep the string stretched by a pencil, C, and move the pencil along, keeping the string at the same tension, then the ellipse E C G L F H will be described. A and B are the foci, D the centre, E F the major axis, and G H the minor axis, D A or D B is the eccentricity of the ellipse. If from any point L in the curve a line L K be drawn parallel to a tangent drawn to the end of the axis E F then will L K be ordinate to the axis E F, corresponding to the point L; and the portions E K, K F, into which L K divides the major axis, are said to be the abscissæ to the ordinate L K.



ELLIPSIS, in grammar, the omission of one or more words, which may be easily supplied by the connection. It is common, especially in colloquial language, for the sake of brevity, and frequently adds to the strength and perspicuity of the sentence. Hence a more extended use of the ellipsis in rhetoric and poetry. In rhetoric it may be applied as a mere artificial ornament, the ellipsis being intended to be supplied not by a logical connection, but by one suggested to the imagination. Such artificial contrivances of rhetoric are, however, almost invariably cold and meaningless devices of pedantry. In the hands of a genuine poet or orator the ellipsis has a very different value. In natural language, from the brevity it affords, the ellipsis becomes in all its phases the language of passion, and especially of sudden and intense emotion; and the imitation of its natural use in this way is to the poet the most powerful instrument for painting passion to the life. The works of all the greater poets, and especially the Hebrew poetry of the Old Testament, abound with familiar instances of this use of the ellipsis.

ELLIPTICITY OF THE TERRESTRIAL SPHEROID, a term used to denote the deviation of the form of the earth from that of a sphere. See **DEGREE** (MEASUREMENT OF).

ELLIS, GEORGE, an ingenious writer, born about 1745, was a native of London, and educated at Westminster School and Trinity College, Cambridge. He obtained an office under government during the administration of Mr. Pitt, and was secretary to Lord Malmesbury in his embassy to Lille in 1797. He was one of the junta of wits concerned in the well known political satire, *The Recluse*, and wrote a preface, notes, and appendix to Way's translation from the French of Le Grand's *Fabliaux*; besides which he published *Specimens of the Early English Poets*, with an Historical Sketch of the Rise and Progress of English Poetry and Language, three vols. 8vo, and *Specimens of Early English Metrical Romances*, three vols. 8vo. The two latter works have passed through several editions; and they display much ingenuity, and a general, though not a profound, acquaintance with English literature. Mr. Ellis, who was a fellow of the Royal Society and the Society of Antiquaries, died in 1815, aged seventy.

ELLIS, JOHN, a celebrated naturalist, and one of the first who suggested the idea that the South Sea Islands were constructed and raised from the bottom of the ocean by means of zoophytes or the polyp inhabiting different species of coral (*Essay towards a Natural History of Corallines*, 1754). He was born in London about 1710, and died in 1776. He was for some time agent for the colony of West Florida and the island of Dominica. Among his works is a posthumous one entitled *The Natural History of many Curious and Enormous Zoophytes* (London, 1786). He was author of an interesting essay on British and Irish Corallines, and also of many valuable papers in the *Philosophical Transactions*.

ELLORA, ELORA, or ELOUROU, a ruinous village, Hindustan, Deccan, Nizam's Dominions, province of, and 12 miles north-west of Aurangabad. Its ruins cover a considerable extent of ground, and are surrounded by a stone wall; but the interest they would naturally create is greatly lessened by the surpassing attractions of the neighbouring cave temples, the most stupendous and magnificent works of the kind in existence. They are excavated in the slope of a hill of red granite, shaped like a horse-shoe, and extend about a mile in length. Some are cut down through the rock, and left open above like an isolated building, and both externally and internally richly ornamented with the most elaborate sculptures. Others are excavated under the hill in the manner of caves properly so called, the interior being supported by massive pillars, variously but harmoniously ornamented. The interior walls likewise are often richly carved with mythological designs, among which human figures are the most numerous, in a great variety of grotesque and distorted forms. The cave temples have been divided into three classes—namely: the north, which are Buddhist, or probably Jain; the central, which are Brahmanical; and the south, which are evidently Buddhist. The most magnificent of the whole is the Hindu temple called *Kailas* or *Cadras*, apparently, like the other Brahmanical temples, dedicated to *Siva*. The central portion is 100 feet high, and forms an isolated excavated mass or immense block 500 feet in circumference. It is surrounded by galleries or colonnades at the distance of 150 feet, in which the whole Hindu pantheon is cut in the perpendicular rock. Every part outside and inside of this magnificent temple is elaborately carved in a most finished manner. Another temple, much smaller, though still likewise very fine, but cut under the hill, is the Buddhist cave of *Vish-*

vakarna. It is remarkable as being the only one excavated with a curved roof; and its design is characterised both by its stupendous proportions and its massive simplicity. The extreme depth of this excavation from the outer gate is 166 feet; the main cave is 80 feet long by 40 feet broad, and 85½ feet high; with twenty-eight octangular pillars, in two rows, besides two pillars supporting a gallery above the door-way. Above the pillars is a narrow architrave, and above this is a broad frieze; both are most elaborately carved; and in niches formed in the latter are sitting figures of Buddha, of whom also there is a colossal figure at the extreme end of the cave. There are six other principal excavations, some in the north, others in the south quarter of the mountain, filled with sculptures. When these caves were excavated is not certainly known; but being in the vicinity of Deoghiri, now Daulatabad, which, prior to the Mohammedan conquest, A.D. 1293, was the capital of a powerful Hindu principality, they probably originated in the superstitious feelings of the reigning families of that metropolis. See Plate II. at ARCHITECTURE.

ELLWOOD, THOMAS, an early writer among the Quakers, was born in 1639 at Crowell, near Thame, in Oxfordshire, where he received such an education as the humble circumstances of his parents would afford. About 1680 he was induced to join the Society of Friends by the preaching of one Edward Burroughs, and he soon after published his first piece, entitled *An Alarm to the Priests, or a Message from Heaven to warn them*. He was imprisoned the same year on account of his religion. He subsequently became reader to Milton, with whom he improved himself in the learned languages, but was soon obliged to quit London on account of his health. In the year 1685 he procured a lodging for Milton at Chalfont, Bucks, and was the occasion of his writing *Paradise Regained* by the following observation made on the return of the *Paradise Lost*, which the poet had lent him to read in manuscript: 'Thou hast said much of paradise lost, but what hast thou to say of paradise found?' In 1705 he published the first part of *Sacred History, or the Historical Parts of the Old Testament*; and in 1709 *Sacred History, &c., of the New Testament*, which production was well received, and is still held in some estimation. His other works are numerous; among them *David's Life of David, King of Israel*, a poem, which is more distinguished for piety than poetry. He died in 1713, aged seventy-four. His life, written by himself, and published the year after his death, affords many interesting particulars of the history of his sect.

ELM. The species of elm (*Ulmus*), the type of the natural order *Ulmaceae*, are trees or shrubs, with alternate serrated and simple leaves, and fascicles of small, inconspicuous flowers, which appear before the foliage. Two species deserve particular notice, *U. campestris* and *U. montana*. The *U. campestris*, or English elm, is a tall, elegant tree, of rapid growth; and although it is not famous for its ramifications, yet, from the density of its foliage and its clustering habit of growth, in bright weather it displays a variety of light and shade, such as painters appreciate in such objects. It is of erect growth, and yields a tall bole, remarkable for the uniformity of its diameter throughout; and few trees produce the same quantity of valuable timber in so short a period. If we except the oak, it is more common than any other timber tree in England, where it is said that upwards of forty places take their names from that of the elm, such as Nine Elms, Barn Elms, &c. Around the palaces, castles, cathedrals, old halls, &c., it is commonly met with of large dimensions and venerable character: but as it rarely produces seed in England,

it is questionable whether it is a native of that country. If not truly indigenous, it must have been introduced at a very early period, and propagated by art. It is a native of the south and middle of Europe, and the west of Asia, and there it yields seed abundantly. In France plants are raised from seed in immense numbers. The tree is remarkable for its propensity to produce seedling varieties; many of these, of very feeble growth, have spread throughout Great Britain, and are of no value as timber trees. The aptitude of the tree to vary from seed has rendered the genus very confused. About twenty sorts of *U. campestris* are cultivated in nurseries, and botanists are unable to determine which are species and which are varieties. The average height of a mature tree is 70 or 80 feet, but some elms are 150 feet high. The wood is brown, hard, and of a fine grain; and as it is not apt to crack, it is adapted for the manufacture of articles that require lateral adhesion, such as the wooden furniture in the rigging of ships; and its quality, as well as its figure of growth, render it very suitable for ship keels. It is also employed by the block and pump maker, the cart-wright, and cabinet-maker; and in London it is the common wood used in making coffins. The tree generally attains maturity in seventy or eighty years; after which it has a tendency to become hollow in the centre—a casualty from which younger trees are not exempt.

U. montana (the Mountain or *Wych Elm*).—This species is a native of Scotland, and very valuable as a timber tree. It grows to a less height than the English elm. Compared with the best varieties of that tree, it is of slower growth, yields a much shorter bole, but is far more spreading in its habit, more bold in its ramification, and more picturesque in figure, more hardy in constitution, and better adapted to adorn the glens and mountain sides which it is destined to occupy. It usually attains to the height of about 50 feet, but it is often found much higher when interspersed with taller-growing trees. It does not produce suckers, like the English elm, but it yields seed freely. It grows best in a rich deep soil, with an open subsoil. Where water stagnates near the surface its growth becomes feeble, and lichen over-spreads its bark. The timber is much in request for agricultural purposes, such as naves for wheels, and handles for spades, forks, and other implements, where strength and elasticity are required. It is also extensively used in ship and boat building. The tree often yields large protuberances of gnarled wood, finely knotted by an accumulation of growth, and richly veined. These are much esteemed for veneering, and are often very valuable.

U. glabra, or smooth-leaved elm, is a species of elm common in some parts of Britain. It is of rapid growth, and forms many varieties. One of these, called the Huntingdon elm, is among the fastest-growing trees of the genus, and valuable for timber. It first appeared about the middle of last century. There are several varieties of cork-barked elm (*U. suberosa*), also of American elm, variegated elm, and curled-leaved elm. The most ornamental and picturesque tree of the genus is *U. pendula*, or weeping elm, of which there are also several varieties.

The American or white elm (*U. Americana*) is found from the 49th to the 30th parallel of latitude, is abundant in the Western States, and extends beyond the Mississippi, but attains its loftiest stature between lat. 42° and 46°; here it reaches the height of 100 feet, with a trunk 4 or 5 feet in diameter, rising sometimes 60 or 70 feet, when it separates into a few primary limbs, which are at first approximate, or cross each other, but gradually diverge, diffusing on all sides long, arched, pendulous branches, which float in the air. It has been pronounced by Michaux 'the most mag-

valuable vegetable of the temperate zone.' Its wood is not much esteemed.

The red or slippery elm (*U. fulva*) is found over a great extent of country in Canada, Missouri, and as far south as lat. 31°; it attains the height of 50 or 60 feet, with a trunk 15 or 20 inches in diameter; the wood is stronger and of a better quality than that of the white elm, is employed in constructing houses, and is good for blocks. The leaves and bark yield an abundant mucilage, to which it owes one of its names, and which is used as a remedy in coughs, and in dysentery and other bowel complaints.

The wahoo (*U. alata*) inhabits from lat. 37° to Florida, Louisiana, and Arkansas, and is a small tree, sometimes 30 feet high, remarkable from the branches being furnished, on two opposite sides, with wings of cork 2 or 3 lines wide; the wood is fine-grained, compact and heavy, and has been used for the naves of coach wheels.

ELMINA, or ST. GEORGE DEL MINA, a town on the west coast of Africa belonging to the British, formerly the capital of the Dutch settlements on the Gold Coast, 5 or 6 miles west of Cape Coast Castle. There is here a large and excessively irregular and dirty native town, the inhabitants of which consist of traders, fishermen, and persons employed as servants to traders. Elmina is defended by a castle and sundry other defensive works. The castle of St. George del Mina was the first European establishment on the coast of Guinea, having been erected by the Portuguese in 1481. It was captured by the Dutch in 1637, was ceded to that nation by the crown of Portugal in 1641, together with some other smaller settlements, and finally to Britain in 1872 along with the other Dutch possessions. Pop. (1891), 10,530.

ELMO'S FIRE, ST., a species of electrical light often seen playing about the masts and rigging of ships, and also about the projecting points of buildings, trees, &c. If two are visible at once the sailors consider it a good omen. It is most common in thundery weather, and in the warmer regions.

ELMSHORN, a town of Prussia, in Schleswig-Holstein, 20 miles north-west of Hamburg, on the railway to Kiel and other places, and on the Kruckan, a navigable tributary of the Elbe, separating the old from the newer parts of the town. It carries on a considerable amount of traffic by land and water, and has manufacturing industries of various kinds, such as in leather, boots and shoes, machinery, dyeing, linen and cotton weaving, distilling and brewing, &c. It is a place of some antiquity. Pop. (1895), 12,207; (1900), 13,640.

ELMSLEY, PETER, D.D., an eminent scholar and philologist, was born in 1773, and educated at Oxford. Having inherited a fortune from his uncle he devoted the remainder of his life to literature. In 1802, being then resident in Edinburgh, he became one of the original contributors to the Edinburgh Review, in which the articles on Heyne's Homer, Schweighäuser's *Athenæus*, Blomfield's *Prometheus*, and Porson's *Hecuba*, are from his pen. He also wrote occasionally, at a subsequent period, in the Quarterly Review. In the pursuit of his philological studies Mr. Elmsley afterwards visited most of the principal libraries on the Continent, and spent the whole of the winter of 1818 in the Laurentian Library at Florence. The year following he accepted a commission from the government to superintend, in conjunction with Sir Humphry Davy, the unrolling of the Hieroglyphic papyrus; in which the selection of the manuscripts was left to his judgment. On his return to England he settled at Oxford, and having taken the degree of Doctor of Divinity, obtained soon after the headship of Alban Hall and

the Camden professorship in 1822. He died in 1825. He published editions of the following tragedies of Sophocles and Euripides: *Oedipus Tyrannus* (1811); *Hæcylides* (1815); *Medea* (1818); *Bacchæ* (1821); and *Oedipus Coloneus* (1823).

EL OBEID. See OBEID.

ELOCUTION is the art by which, in delivering a discourse before an audience, the speaker is enabled, with greatest ease and certainty, to render it effective and impressive. The value of an elocutionary training to public speakers is very great, as well in sparing the voice, as in overcoming natural defects or provincialisms in delivery, and in cultivating and developing the natural taste. It is surprising that any public speaker should be left without the benefit of such a training, but in this country educational habits have hitherto made it the exception rather than the rule.

ÉLOGE (French) is a discourse pronounced in public in honour of the memory of an illustrious person recently deceased. In modern times the éloge is peculiarly a French institution, and has given rise to a quite distinct species of literature, which, though its style is not the most agreeable, is not altogether without utility, as the best éloges frequently contain rapid and summary views of the state of science, art, literature at a particular time, of the works of some distinguished author, the political events of a period, or whatever other theme may be suggested to the orator by the particular career of the subject of his eulogy. Such summaries, of course, considering the object with which they are made, must be received with great caution, but they frequently convey information not easily accessible in other ways. An éloge is pronounced over every member of the Academy when he dies, as the inaugural discourse of the new member who is chosen to succeed him. The abuses to which this style of composition is liable have given rise to burlesque and satirical éloges.

ELOHIM (plural of *Eloah*), one of the Hebrew names for God, of frequent occurrence in the Bible. Elohim is used in speaking both of the true God and of false gods, while Jehovah is confined to the true God. The plural form of Elohim has caused a good deal of controversy among critics. By some it has been considered as containing an allusion to the doctrine of the Trinity, others regard it as the plural of excellence, while others hold it as establishing the fact of a primitive polytheism. This word, along with Jehovah, has played a great part in modern criticism. Critics have professed to find in the comparative frequency of the two terms an evidence of the date of the manuscripts in which they occur; but on this controversy we cannot enter.

ELONGATION, ANGLE OF, the angle that measures the apparent distance of two stars as seen from the earth. The term is, however, by usage confined exclusively to the distance of a planet from the sun, and of a satellite from its primary. When two fixed stars or two planets are spoken of, the word *distance* is employed.

ELOPEMENT, in law, is when a married woman, of her own accord, departs from her husband and dwells with an adulterer; for which, without voluntary reconciliation to the husband, she shall lose her dower. The term popularly denotes a runaway marriage.

ELPHINSTONE, WILLIAM, a celebrated Scottish prelate, founder of King's College, Aberdeen, was born at Glasgow in 1431. His father was an archdeacon of the Scottish Church, and the son was educated at Glasgow College, where he passed A.M. about his twentieth year. After applying himself to theology he was made priest of St. Michael's, Glasgow, where he served four years; then having gone

to France he studied law for three years, and was appointed professor of law, first at Paris and subsequently at Orleans. In 1471 he returned home at the request of his friends, particularly of Muirhead, bishop of Glasgow, who made him parson of the town and commissary of the diocese. On the decease of Muirhead, the Archbishop of Glasgow made him official or commissary of the Lothians, which office he continued to discharge till 1478. About the latter year he was sent with the Earl of Buchan on an embassy to France, and on his return in 1479 was made Archdeacon of Argyll. Soon after he was made Bishop of Ross; and in 1483 was transferred to the see of Aberdeen. In 1484 he was appointed a commissioner to treat of a truce and matrimonial alliance with England. On the defeat and death of Richard III. he was again sent in 1486 to negotiate a fresh truce with Henry VII. In 1488 he was made lord high-chancellor of the kingdom. In October of that year he assisted in the coronation of James IV. He was afterwards sent on a mission to Germany, and on his return was installed in the office of lord privy-seal, which he held till his death, which occurred on the 25th October, 1514. It is said that he wrote *Lives of the Scottish Saints*, a work which has been lost; and a continuation of the *Scotichronicon* of Fordun, in the Bodleian Library at Oxford, has been erroneously attributed to him. Certain volumes on the canon-law, in the library of the University of Aberdeen, bear his name, but perhaps only as the possessor. In 1494 he obtained a papal bull for the erection of a university at Aberdeen, and King's College and University soon came into existence.

ELPHINSTONE, THE HONOURABLE MOUNTSTUART, governor of Bombay, was the fourth son of the eleventh Lord Elphinstone, and was born in 1778. He joined the Bengal civil service at the age of eighteen, and early became an *attaché* to the political resident at the court of the peishwa. He was attached to General Wellesley's mission to the Marhatta chiefs, and afterwards accompanied the general as aid-de-camp at the battle of Assaye. In 1808 he was intrusted with a mission to the courts of Cabul and Peshawur, and concluded an important treaty with Shah Shuja. Mr. Elphinstone published an account of this expedition. He was the British representative at the court of the peishwa in 1816, when the Marquis of Hastings took the command of the army against the Marhatta confederacy, was present at the battle of Kirkee, and was afterwards nominated sole British commissioner for the settlement of the peishwa's territories. He became governor of Bombay, to which the territories of the peishwa were attached, in 1819. During a government of seven years he established a code of laws, lightened taxes, and paid great attention to schools and public institutions. He left India in 1827. Among other acknowledgments of his government a college established by the natives was called after him Elphinstone College. On his return he wrote his *History of India*, which was published in 1841. He was offered the governor-generalship of India in 1835, and afterwards that of Canada, both of which he declined, as well as other honours which were placed at his disposal. He died 20th Nov. 1859.

ELIASS. See **ALSAEC.**

ELIASSER, FRIEDRICH AUGUST, a distinguished German landscape-painter, born at Berlin, in 1810, of humble parentage. He early showed a very decided taste for art, obtained a free admission to the Academy, and after he had displayed his skill in some landscapes, was enabled to proceed to Rome, where he henceforth chiefly lived, working assiduously at his art, and studying music and modern languages. He undertook a laborious and even danger-

ous journey through Calabria, and industriously prosecuted his studies in unwholesome woods and vines, where unfortunately he laid the foundation of a pulmonary complaint which ultimately brought him to the grave. After visiting the baths of Germany without any beneficial result, he died at Rome in 1846. Few have succeeded in depicting the peculiarities of a southern climate, the rich vegetation, the bright sky, the beautiful Italian back grounds, with so much truth and poetry.

ELSHOLTZ, JOHANN SIGISMUND, was born at Frankfort on the Oder, August 26, 1623. He studied there and at Wittenberg and Königsberg, travelled in Holland, France, and Italy, and became doctor at Padua, 1653. On his return to Germany he was nominated in 1656 court physician, and botanist to the garden then instituted at Berlin, posts which he held to the end of his life. He was the author of papers and works on botanical, medical, and chemical subjects; he carried on a discussion about transmutation, the discovery of which he claimed; wrote a book about distillation; and a paper on phosphorus, in which is noticed for the first time the phosphorescence of green fluor-spar. He died at Berlin in 1688.

ELSINORE, or **ELSINUR** (Danish, *Helsingør*), a seaport town of Denmark, in the island of Seeland, at the narrowest part of the Sound, here only 8½ miles broad, 24 miles north by east of Copenhagen. It has two churches, a classical school, and a custom-house; its inhabitants are chiefly engaged in commerce and seafaring, and considerable traffic is carried on with Helsingborg, on the opposite coast, this being the chief point of transit between Denmark and Sweden. Elsinore is defended by the castle of Kronborg, built about 1580, which stands on a projecting spit of land, and commands the Sound. It is a Gothic-Byzantine edifice, built by Frederick II. in the boldest style, and is said to be one of the finest structures of its kind in Europe. It is now chiefly used as a prison, and was the place of confinement of the unfortunate Matilda, sister of George III. of England. From the summit of the lighthouse, showing a fixed light 118 feet high, the scene is of great beauty. Before the abolition of the Sound dues, compounded for in 1857 by the payment of £3,324,682, of which Great Britain contributed one-third, all merchant ships were bound to salute the castle, and to clear out at Elsinore, paying the toll. This charge was originally instituted for the purpose of keeping up lights and land-marks on the Cattegat and neighbouring coasts. Pop. (1901), 13,902.

ELSTER, two German rivers.—1. The **WHITE**, or Great Elster, rising in the west of Bohemia, flows north into Saxony, receives the Pleisse and Parde at Leipzig, and joins the Saale between Halle and Merseburg, after a course of about 115 miles.—2. The **BLACK ELSTER**, rising in Saxony, flows north into Prussia, then north-west, receives the Pulnitz and Roder, and joins the Elbe between Wittenberg and Torgau, after a course of about 100 miles.

ELVAS, a town, Portugal, province of Alentejo, near the Spanish frontier, 12 miles north-west of Badajoz. It occupies a central height flanked by two others, each of which is crowned by a castle, and is of such strength that it has been deemed all but impregnable. It consists generally of narrow crooked streets, but many of the houses, which are Moorish, have a picturesque and interesting appearance, with their arched fronts, latticed windows, and verandahs. The most remarkable structures are the cathedral, partly Moorish and partly Gothic, and the Moorish aqueduct, a magnificent work which brings water from a distance of 15 miles, and in the vicinity of the town crosses a valley on four tiers of arches, which have a total height of 250 feet. Pop. (1900), 14,018.

ELWES, JOHN, a celebrated miser, was born in Westminster on April 7, 1714. He was the son of a wealthy brewer named Meggot, but he changed his name on becoming heir to his uncle, Sir Harvey Elwes, as great a miser as himself. He was educated at Westminster School, and in his younger days was noted for his skill in horsemanship and love of the chase. His stable and kennel of foxhounds were considered among the best in the kingdom. He lost money at cards and also by speculation. Latterly his penuriousness increased to such an extent that he denied himself every comfort, maintaining such a degree of parsimony as almost transcends belief. He never lighted a fire, wore his clothes till they fell off in rags, and fed on all sorts of garbage, being one day observed to make a meal of part of a water-buten which a rat had left on the banks of a stream. Towards the end of his life his constant fear was to die of poverty; and in this respect he seems to have been haunted by a true monomania, which may also partly explain his general miserly habits. In spite, however, of his penurious disposition, he was singularly kind-hearted, ever ready to do anyone a service, even at great inconvenience to himself. It is said by those who knew him that he would lend his friends considerable sums, and then shortly afterwards haggle with a tradesman over a penny. From his influential position he was invited to stand as member for the county of Berks, and this he agreed to do on the express stipulation that his return should cost him nothing. He was elected in 1774, and sat in three parliaments till 1787. His wealth and his parsimonious habits increased in an equal ratio, and at his death in 1789 he left behind him a fortune of half a million, partly in entailed estates, to his grand-nephew and two natural sons.

ELY, an episcopal city of England, in the county and 15 miles N.W. of Cambridge, on an eminence on the left bank of the Ouse. It has a spacious marketplace in the centre. Some of the houses, particularly those in the vicinity of the cathedral, are very old, as their external appearance indicates. There are a commodious shire-hall, a grammar-school, a theological college, a corn-exchange, and a cattle-market. The ecclesiastical structures comprise the cathedral, the churches of St. Mary and the Holy Trinity, the latter belonging to the time of Edward II., and one of the most perfect buildings of that age; besides other places of worship. The cathedral is one of the most remarkable edifices of the kind in England. It occupies the site of a monastery founded about the year 673 by St. Etheldreda (or Audry), daughter of Anna, king of East Anglia. Its external length, east to west, is 565 feet—said to be the greatest of any cathedral in Europe. Its west tower, which is of the most beautiful workmanship, is 220 feet high, and is surmounted by an octagonal lantern with side turrets. "A unique feature of the structure is the octagon rising in place of a central tower, with a Gothic dome as a roof and a lofty lantern above it, 'perhaps the most beautiful and original design to be found in the whole range of Gothic architecture'." The whole structure comprises an almost unbroken series of the various styles of architecture which prevailed in England from the Conquest to the Reformation, and so judiciously blended, and generally so perfect in their kind, as to produce no disagreeable effect by their admixture. The nave is Norman, and is one of the finest specimens of that style in England; the transepts are also mainly Norman. There is a large Lady chapel (late Decorated) used as a parish church. The west front has a two-storied porch or gallerie. This magnificent edifice has latterly undergone extensive alterations, additions, and restorations, including an elaborate

restoration of the choir, the opening of the lower part of the tower to the area of the nave below, a new choir-screen, the decoration of the ceiling of the nave, and externally the erection of a new lantern upon the octagonal tower. A considerable portion of the ancient conventual buildings still remains, and the refectory has been converted into the deanery. A fine old gateway, of ample dimensions, built in the reign of Richard II., forms the principal entrance to the precincts of the cathedral. The city of Ely has no manufactures worth noticing, except those of baskets and fruit preserves. There are extensive market gardens in the vicinity, the produce of which is sent to London and Cambridge. Pop. (1881), 8171; (1891), 8017; (1901), 7713.

ELY, ISLE OF, a district in England, in the county of Cambridge, separated on the south by the Ouse from the remaining portion of the county, and forming itself a sort of county. It is about 28 miles long by 25 miles broad; area, 227,326 acres. The name is often restricted to a smaller tract, about 7 miles long by 4 miles broad. It rises about 100 feet above the general level of the fen country, and was formerly surrounded by marshes, which at times became sheets of water. The whole has by drainage been converted into fertile fields. Pop. of the Isle of Ely in wider sense (1891), 63,861; (1901), 64,494.

ELYSIUM, ELYSIAN FIELDS, the name of a fabulous region which the ancients supposed to be the residence of the blessed after death. Elysium is supposed by Homer to have been at the extremities of the earth; other poets placed it in the Fortunate Islands (the Canaries); latterly it was transferred to the under world. Here the most beautiful meadows alternated with pleasant groves; a serene and cloudless sky extended above; a soft celestial light shed a magical brilliancy over every object; the heroes there renewed their favourite sports; they exercised themselves in wrestling and other contests, danced to the sound of the lyre from which Orpheus drew the most enchanting tones, or wandered through odoriferous groves, on the smiling banks of the Eridanus, in delightful vales, or in meadows watered by limpid fountains, amid the warbling of birds; a perpetual spring reigned; and all cares, pains, and infirmities were banished from those happy seats. The voluptuous description of the gardens of Armida, in Tasso's *Jerusalem Delivered*, is an imitation of the ancient ideas of the Elysian fields.

ELYTRA, the name for the wing-cases, that is, the hard coverings which inclose the wings, of coleopterous insects or beetles. They are themselves wings, but are less important for flight than for protecting the true wings, which are folded up beneath them when in a state of repose.

ELZEVIUS, or ELZEVIUS. This family of publishers and printers, residing at Amsterdam and Leyden, is celebrated for beautiful editions, principally published from 1595 to 1680. The best known are **LOUIS**, **MATTHEW**, **ABRAHAM** (associated with Buonaventura), **ISAAC** (the first printer of the family), **JOHN**, and **DANIEL**, at Amsterdam and Leyden. Besides these was **PETER ELZEVIUS**, at Utrecht, who has done less for the art. Louis was the first who made a distinction between the consonant *v* and the vowel *u*. Abraham and Buonaventura prepared the small editions of the classics, in 12mo and 16mo, which are still valued for their beauty and correctness. Daniel was one of the most active of this family. Although the Elzevirs were surpassed in learning, and in Greek and Hebrew editions, by the Stephenses (Etienne's, printers and booksellers at Paris), they were unequalled in their choice of works, and in the elegance of their typography. Their editions of Virgil, Terence,

the New Testament, the Psalter, &c., executed with red letters, are masterpieces of typography, both for correctness and beauty. See Brunet's *Notice de la Collection des Auteurs, imprimés par les Elzevir*, in the fifth vol. of the *Manuel du Libraire*, and Ch. Pieter's *Annales de l'imprimerie des Elzevir* (Ghent, 1860).

EMANATION, an efflux, from the Latin *emanare*, to issue, to flow out, to emanate. Philosophical systems, which, like most of the ancient, do not adopt a spontaneous creation of the universe by a Supreme Being, frequently explain the universe by an eternal emanation from the Supreme Being, as light is from the sun, without producing diminution of substance or power. This doctrine came from the East. Traces of it are found in the old Persian or Bactro-Median doctrine of Zoroaster. It had a powerful influence on the ancient Egyptian philosophy, as also on that of the Greeks, as may be seen in Pythagoras. The system was subsequently developed by Plotinus of Alexandria, and various modifications of it are maintained by the Gnostics, the Manicheans, and the Pantheists.—In theology, the doctrine of emanation is the doctrine of the Trinity, which regards the Son and Holy Ghost, &c., as effluxes from the Deity himself.

EMANCIPATION, in ancient Roman law, the act by which a minor was released from paternal authority. This was effected by a fictitious sale by the father of his son or daughter to a third party, who manumitted them. Females were emancipated by a single sale; but males did not attain their full freedom of action and responsibility until sold three times; usually the son was resold at last to the father, who set him free, and thus acquired the right of a patron. By the Code Napoléon, majority (and with it emancipation) is attained at the age of twenty-one, or in the event of the marriage of the minor. In the wide sense in which the word is now used it signifies release from an unjustifiable state of subjection.—In politics it signifies the granting of certain privileges to those from whom they have been kept owing to difference of nationality, sex, creed, &c. See **CATHOLIC EMANCIPATION** and **SLAVERY**.

EMANUEL THE GREAT, King of Portugal, ascended the throne in 1495. During his reign were performed the voyages of discovery of Vasco da Gama, of Cabral, of Amerigo Vesputius, and the heroic exploits of Albuquerque, by whose exertions a passage was found to the East Indies (for which the way was prepared by the discovery of the Cape of Good Hope, in 1486, by Bartolomeo Diaz), the Portuguese dominion in Goa was established, the Brazil, the Moluccas, &c., were discovered. The commerce of Portugal, under Emanuel, was more prosperous than at any former period. The treasures of America flowed into Lisbon, and the reign of Emanuel was justly called 'the golden age of Portugal.' He died in 1521, aged fifty-two, deeply lamented by his subjects, but hated by the Moors and the Jews, whom he had expelled. As a monument of his discoveries, Emanuel built the monastery at Belem, where he was buried. He was a friend to the sciences, and to learned men. He left *Memoirs on the Indies*.

EMBALMING, the process of filling and surrounding with aromatic, discolative, and antiseptic substances any bodies, particularly corpses, in order to preserve them from corruption. The ancient Egyptians employed the art on a great scale, and other peoples, for example the Assyrians, Scythians, and Persians, followed them, but by no means equalled them in it. The ancient Peruvians appear to have injected and washed the corpses with the fluid that flows from imperfectly burned wood, which would of course

contain pyroligneous acid, creosote, and other antiseptics. Pliny alludes to the use of a similar fluid by the Egyptians for embalming. It is often alleged that the art has degenerated very much from the high degree of perfection at which it stood among the ancients; nevertheless, though the embalming of the dead is less frequent, by processes now known the operation can be performed more perfectly, and in a much shorter period than in early times.

In the most common methods of embalming the intestines and brains are taken out and the cavities filled up with a mixture of balsamic herbs, myrrh, and others of the same kind; the large blood-vessels and other vessels are injected with balsams dissolved in spirits of wine; the body is rubbed hard with spirits of the same kind, &c. The ancient Egyptians removed the viscera from the large cavities, and replaced them with aromatic, saline, and bituminous substances, and also enveloped the outside of the body in cloths impregnated with similar materials. These were useful in preventing decomposition and excluding insects until perfect dryness took place. See **MUMMIES**.

In later times bodies have been preserved a long time by embalming, especially when they have remained at a low and uniform temperature, and have been protected from the air. The body of Edward I. was buried in Westminster Abbey in 1307, and in 1770 was found entire. Canute died in 1036; his body was found very fresh in 1776, in Winchester Cathedral. The bodies of William the Conqueror and of Matilda his wife were found entire at Caen in the sixteenth century. Similar cases are not uncommon.

In many instances bodies not embalmed have been preserved from decay merely by the exclusion of the air and the lowness of the temperature, and also by the place in which they are kept. Certain caverns and vaults are reported to have this preservative effect, such as the vaults at Dublin, the Cordeliers Cemetery at Toulouse, and especially the famous Capuchin burying-vaults near Palermo. It is said, however, that in the last instance, whatever may have been the power of the vault at one time, the bodies are now treated with corrosive sublimate before they are deposited there. Impregnation of the animal body with corrosive sublimate, indeed, appears to be one of the most effectual means of preserving it, next to immersion in spirits. The impregnation is performed by the injection of a strong solution, consisting of about 4 oz. of bichloride of mercury to a pint of alcohol, into the blood-vessels, and after the viscera are removed, the body is immersed for three months in the same solution, after which it dries easily, and is almost imperishable. *Wet preparations*, or those immersed in alcohol or oil of turpentine, last for an indefinite time.

About 1832 Messrs. Capron and Boniface, two French chemists, by a process which they kept secret, affirmed that they could preserve the human figure in a manner superior to any hitherto practised, not only the external body, but all the viscera, the lungs, the heart, the liver, and even the brain, being perfectly preserved. At a meeting of the *Académie des Sciences* a human body and two hearts, preserved in this manner, were exhibited, and the process appeared perfect; yet it seems to have been employed but to a small extent. One of the best-known processes of modern times is that of M. Gannal, which consists in injecting into the blood-vessels of the dead body a concentrated solution of aluminium sulphate or of aluminic chloride. This method is employed also for anatomical preparations as well as for embalming. In a memoir laid before the Academy of Sciences of Paris M. Falconi made known the

result of a series of experiments on the effects of different salts, the conclusion he arrived at being that the most powerful preservative agent is sulphate of zinc of different degrees of strength, injected into the vessels of the body. New methods continue to be from time to time proposed.

EMBANKMENT, a mound of earth, &c., thrown up for the purpose of forming a roadway at a level different from that of the natural surface of the ground, or for keeping a large body of water within certain limits. The main conditions of embankments are: (1.) That the slopes are such as should be permanent. It is found, in executing embankments required for supporting railways or ordinary roads, or those which have merely to support a vertical weight, that the slope required to be given to loose rubble, chalk, stone, loamy sand, or gravel, corresponds to about $1\frac{1}{2}$ base to 1 vertical; dry, loose sand and ordinary clay should have about 2 horizontal to 1 vertical. Some clays would require a much wider base. A bank faced with stone may, of course, be built with safety at a much higher angle. (2.) That the embankment should not slip vertically, as when erected on marshy or peaty soils. Various plans have been adopted in cases of this nature. In Holland the weight of the heart of the embankment is diminished by introducing layers of reeds or fascines; in other parts of the Continent pits are sunk in the subsoil at short distances from each other, and filled with incompressible materials; in other instances the mounds have been raised upon a bed of concrete, or sand prevented from spreading laterally. Piling is also a successful method. (3.) The embankment must be prevented from slipping laterally. This may be effected by forming steps in the earth of the subsoil, or by cutting deep trenches at the feet of the respective slopes. This has the further advantage of preventing the passage of water between the soil and the seat of the mound. In cases where embankments are raised for the storage of water, it is imperative to insert a 'puddle-dike,' that is, a water-tight wall, through the whole depth of the bank down to the impermeable strata beneath. To resist the action of wind and rain, or of the waters of a slow-flowing stream, the bank should in all possible cases be covered with turf; when, however, the action of the water is violent, the expensive processes of stone pitching or piling must be resorted to. The largest embankments hitherto executed are those on the banks of the Po, the Loire, the Rhine, the Meuse, the Scheldt, the Thames, the Ouse; on the shores of Zealand, Holland, Friesland; the Oberhäuser embankment on the Augsburg and Lindau Railway, the Gadelbach cutting on the Ulm and Augsburg line, and the Tring cutting on the North-western Railway.

EMBARGO, in commerce, an arrest on ships or merchandise, by public authority; or a prohibition of sale, commonly on foreign ships, in time of war, to prevent their going out of port, sometimes to prevent their coming in, and sometimes both for a limited time. A breach of embargo, under knowledge of the insured, discharges the underwriters of all liability.

EMBASSY, in its strict sense, signifies a mission presided over by an ambassador, as distinguished from a legation or mission intrusted to an envoy or agent. The difference between the powers and privileges of an ambassador and an envoy is, that the former, as the representative of the person of his sovereign, can demand a private audience of the sovereign to whom he is accredited, while the latter must communicate with the minister for foreign affairs.—In the popular sense, the word signifies any diplomatic mission whatever.

EMBAYED, the situation of a ship when she is

inclosed between two capes or promontories. It is particularly applied when the wind, by blowing strong into any bay or gulf, makes it extremely difficult, and perhaps impracticable, for the vessel thus inclosed to draw off from the shore so as to weather the capes and gain the offing.

EMBER-DAYS, in the Anglican and R. Catholic Churches, are certain seasons of the year set apart for the imploring God's blessing, by prayer and fasting, upon the fruits of the earth, and the ordinations performed in the church at such times. The ember-days were formerly observed in different churches with some variety, but were at last settled as they are now observed by the council at Placentia, in 1095. They occur four times a year, being the Wednesday, Friday, and Saturday after the first Sunday in Lent, after the feast of Pentecost or Whit Sunday, after the festival of the Holy Cross (14th Sept.), and after the festival of St. Lucia (13th Dec.) The weeks in which these days fall are called *Ember-weeks*.

EMBEZZLEMENT is the appropriation, by a clerk or servant, to himself, of money or property put into his hands in trust. An embezzlement is both a theft and breach of trust; yet, by the general law, it is only a ground for an action for the value of the property. But there are many special provisions in relation to particular embezzlements and breaches of trust. By the law of England, a clerk guilty of embezzlement is liable to penal servitude for a term not exceeding fourteen years; and a public servant committing the like offence is declared guilty of a misdemeanor, and punishable at the discretion of the court. Still more severe provisions are made in the case of embezzlement by the officers and clerks of banks. Partners stealing money, &c., belonging to the copartnership may be convicted and punished as if they had not been such partners.

EMBLEM (Greek, *emblēma*, from *emballlein*, to cast in, to insert). Originally this word was used to designate all kinds of inlaid or mosaic work; it is now applied to a picture representing one thing to the eye and another to the understanding. The meaning of the emblem rests on its secondary, not its primary signification. The most common emblems are such as a balance, which represents justice; a crown, an emblem of royalty; the serpent, of cunning; the dove, of innocence, &c.

EMBLEMENTS (from the old French *emblemance de bled*, corn sprung or put above ground), a term applied to the growing crops of land when the lease of a tenant for life has expired by the death of the tenant, or when an estate at will has been determined by the lessor. In either case the emblements belong to the tenant or his executors. But when the estate is determined by the lease itself, as when there is an estate for a term of years, or when the tenant puts an end to his occupation by his own voluntary act, he will not be entitled to the crops, for the law does not relieve from voluntary obligations. Growing crops may be distrained for rent, and sold when ripe.

EMBOSSING, the art of producing raised figures upon plane surfaces, such as on leather for book-binding, &c.; on paper for envelopes, &c.; on wood or bronze, in architecture or sculpture. In the two last-mentioned arts, in proportion as the figures are more or less prominent, they are said to be in *alto*, *mezzo*, or *basso rilievo* (high, half, or low relief). Leather, paper, and textile fabrics are embossed by powerful presses furnished with dies of the desired pattern. A simple but ingenious and effective method of embossing wood is sometimes made use of. The parts intended to be in relief are sunk by the application of a blunt steel tool as deep into the wood as they are intended to be raised above the surface.

care being taken not to injure the grain of the wood. The surface is then planed down to the level of the depressions; the wood is afterwards placed in water, when the compressed parts rise to their original level, and the work is finished by carving as ordinarily practised.

EMBROACERY, an attempt to corrupt or influence a jury by money, promises, letters, threats, or persuasions, whether the jury give a verdict or not, or whether the verdict given be true or false. This offence is punished by fine and imprisonment.

EMBROASURE, in fortification, an opening made in the breastwork or parapet of a battery or fortress, to admit of a gun being fired through it.

EMEROCATION, a lotion or combination of medicinal liquids, with which any diseased part is rubbed or washed.

EMBROIDERY, figured work in gold, or silver, or silk thread, wrought by the needle, upon cloths, stuffs, or muslins. In embroidering stuffs, a kind of stretching-frame is used, because the more the piece is stretched the easier it is worked. Muslin is spread upon a pattern, ready designed, and sometimes, before it is stretched upon the pattern, it is starched to make it more easy to handle. The art of embroidery was invented in the East, probably by the Phrygians. In Moses' time Aholiab, of the tribe of Dan, was noted for skill in embroidery, and the women of Sidon, before the Trojan war, excelled in the same art. Though the Greeks attributed the invention of the art to Minerva, yet it is certain that it came through the Persians to Greece. The King of Pergamus (Attalus), in the year of Rome 621, invented the mode of embroidering with gold thread. In modern times the art has been much extended, and in some parts gives employment to considerable numbers of people. See TAMBOUR, TAPESTRY.

EMBRUN (ancient, *Eburadunum Caturigum*), a town, France, department of Hautes-Alpes, on a rocky eminence in the centre of a large plain watered by the Durance, 20 miles east from Gap; pop. 3812. It is an ancient place, surrounded by walls and ditches, and of very picturesque appearance, though the streets are irregular, dark, and crooked. It was pillaged successively by Vandals, Huns, and Saxons, and its inhabitants almost exterminated by the Moors in 966. It is still a bishop's, and was once an archbishop's see, and has a beautiful cathedral with a lofty spire.

EMBRYO, the first rudiments of the animal in the womb, before the several members are distinctly formed, after which it is called the *fœtus*, though the latter name is also applied to the young animal in all its stages. In plants the embryo is the rudimentary organism contained in the seed.

EMBYOLOGY. The history of animals, from the first appearance of organization in the egg up to the attainment of the perfect form at or shortly after their escape from the egg, is ascertained by embryology, a field of inquiry which only the great perfection of modern investigations has allowed to attain its present rank. The importance of the study depends upon this, that the history of animals thus traced reveals the existence of structures which disappear at a later period, or become obscured by arrest of their development, or by union with other parts, and permits us to follow the steps by which complex organs arise by the combination of simpler parts. Thus resemblances are detected, points of affinity recognised between species and orders whose adult aspect is very unlike. In the crustaceans, for example, the barnacles (*Ostrhipedia*) were placed among molluscs when classification was based on external features: it is now known that they pass through embryonic stages in which they agree in form with the young of

other crustaceans; that they are, in fact, crustaceans which, as they approach maturity, become modified, and ultimately are adapted for an exclusively sedentary life. It also appears that this so-called stage is met with more or less distinctly marked in all crustaceans; but that in some it disappears early, as in the crabs; in others, as the copepods, the adult still retains the general aspect. The dates at which these common embryonic characters are lost furnish a guide to classification, since presumably an adult departs farther from its earlier form the more complex is its structure, and the more highly specialized are its organs. Thus the lobster retains the elongated flexible abdomen of one zoal stage, that of the *Megalops*, while in the crab the abdomen ceases to enlarge after a time, and ultimately becomes an appendage no longer useful for swimming. Similarly the fish retains throughout life the gills which the frog loses in the tadpole stage; while reptiles, birds, and mammals exhibit, in their embryonic state, the clefts separating these processes to which the gills were attached in the lower forms. The embryonic development of insects and other articulated animals proves that the highly altered organs around the mouth which serve as masticatory or suctorial apparatus, are in their earliest condition identical with the locomotive limbs, but become specialized as development advances. In those classifications which set forth the relationships of animals by descent, the common embryonic characters are held to exist in the descendants from a common stock, and the relative dates of their disappearance to correspond to their successive divergences from that stock. Thus the crab would represent an earlier commencement of specialization than the lobster, and both are earlier divergences from the primitive type than the Copepods and Entomostracans, which are nearer to the zoal form. But apart from such speculations, embryology is becoming a most important element in classification, since the characters of an animal are not those of its adult state merely, but must include all the structural features which it presents at every period of its life. See REPRODUCTION.

EMDEN, a town of Prussia, in the province of Hanover, on the right bank of the Ems, near where it discharges itself into the Dollart estuary. It has very much the appearance of a Dutch town, occupying a low flat intersected by numerous canals. The streets are, for the most part, spacious and well-paved; and the houses, built generally of brick, have a substantial, comfortable look. The principal buildings are the great (Protestant) church, partly belonging to the twelfth century, surmounted by a lofty tower, several other churches, including the French Reformed church, the town-house (1574-76), with a lofty tower and a spacious hall; the court-house, custom-house, &c. Emden has an excellent roadstead, and its harbour is connected with this by a canal admitting large vessels. The Dortmund-Ems and other canals connect it with the interior. Its export trade includes grain, dairy produce, cattle, tallow, wool, hides, &c.; and it imports coals, timber, wine, and colonial produce. In the building yards a considerable number of vessels are annually built; and the manufactures, though far less important than the trade, include leather, paper, wire ropes, bricks, soap, and tobacco. There are also oil-mills, breweries, and distilleries. Pop. (1900), 16,453.

EMERALD is a well-known gem of pure green colour, often very rich and beautiful. It is a silicate of aluminium and the rare element glucinum or beryllium, which was detected in it by Vauquelin, after it had been discovered by the same chemist in the beryl. Its natural form is either rounded or that of a short six-sided prism. It is a little harder than quartz,

and has a specific gravity of 2.67 to 2.78. It is not acted on by acids. By the ancients the emerald was in great request, particularly for engraving upon. They are said to have procured it from Ethiopia and Egypt. The most intensely coloured and valuable emeralds that we are acquainted with are brought from Peru. They are there found in a peculiar limestone, and in other localities in mica slate. The emerald is one of the softest of the precious stones, and is almost exclusively indebted for its value to its charming colour. By some this colour is ascribed to traces of chromium, by others to the presence of organic matter; but it seems now certain that it is really due to chromium. In value it is rated next to the ruby, and, when of good colour, it is set without foil, and upon a black ground, like brilliant diamonds. Emeralds of inferior lustre are generally set upon a green gold foil. These gems are considered to appear to greatest advantage when table-cut and surrounded by brilliants, the lustre of which contrasts well with the green of the emerald. They are sometimes formed into pearl-shaped ear-drops; but the most valuable stones are generally set in rings. A favourite mode of setting emeralds, among the opulent inhabitants of South America, is to make them up into clusters of artificial flowers on gold stems. The largest emerald that has been mentioned is one said to have been possessed by the inhabitants of the Valley of Manta, in Peru, at the time when the Spaniards first arrived there. It is recorded to have been as big as an ostrich's egg, and to have been worshipped by the Peruvians under the name of the *goddess or mother of emeralds*. Emeralds are seldom seen of large size, and at the same time entirely free from flaws. If heated to a certain degree the stone assumes a blue colour, but it recovers its own proper tint when cold. When the heat is carried much beyond this it melts into an opaque, colourless mass. The oriental emerald is a variety of the ruby, of a green colour, and is an extremely rare gem. See BERYL.

EMERALD GREEN, known also as SCHWEINFURTH GREEN, and by a great number of other names, is one of the most beautiful green pigments. The exact chemical composition has not been definitely established, and there may be variations according to the mode of preparation adopted; but it appears to contain copper, arsenic, and acetic acid, and is usually regarded as an aceto-arsenite of copper. It is a crystalline powder, which becomes paler by grinding, is not affected by light and air, and is insoluble in water, but is decomposed by alkalis. It is used both as a water and as an oil colour, and it is often printed upon wall-papers. It is extremely poisonous.

EMERSON, RALPH WALDO, one of the most distinguished American writers and thinkers, was born at Boston in 1803, being the son of a Unitarian clergyman. He graduated at Harvard in 1821, and for five years taught in a school. Having studied divinity he was ordained as minister to a Unitarian church in Boston in 1829, but in 1832 resigned his charge, announcing his unwillingness any longer to administer the rite of the Lord's supper. In December, 1832, he sailed for Europe and remained absent nearly a year, having had interviews with Carlyle, Coleridge, Wordsworth, and other eminent writers. On his return he began his career as a lecturer, in which capacity he acted for a long series of years, and was known throughout the whole of the United States. In 1836 he took up his permanent residence at Concord, Mass. Next year he published a small volume called *Nature, treating of freedom, beauty, and culture in relation to the outer world*. He was one of the original editors and chief supporters of the *Dial*, a magazine begun in 1840, and identified with the best of thought known as 'transcendentalism.' Two volumes of his

essays were published in 1841 and 1844, and his poems in 1846. His miscellaneous addresses had been collected and published in England in 1844, and on visiting this country in 1847 he was welcomed by a large circle of admirers. In London he lectured on various topics. In 1850 he published *Representative Men*, including portraits of Plato, Shakspeare, Montaigne, Swedenborg, Napoleon, Goethe; in 1856, *English Traits*; in 1860, *The Conduct of Life*; in 1869, *May Day and Other Poems*, and *Society and Solitude*; in 1871, *Parnassus*, a collection of poems; in 1876, *Letters and Social Aims*. In 1866 he received the degree of LL.D. from Harvard University. Mr. Emerson died April 27, 1882. He was twice married. He took but little active part in public life, but he was always ready to lend his voice on behalf of any important movement. Though sometimes looked upon as a philosopher he was more of a poet and literary man than of a systematic teacher, his writings being rather suggestive of thought than directly didactic. Some of his essays, it has been remarked, seem 'merely accidental collections of loose leaves from a note-book.' His writings, however, have had a strong influence on the literature of America. See Ralph Waldo Emerson: *Life, Writings, and Philosophy*, by G. W. Cooke (1882); *Memoir*, by J. E. Cabot (1887), who also edits his works; and Emerson in Concord, a memoir by his son (1869).

EMERY, an impure variety of corundum, of blackish or bluish-gray colour, is chiefly found in shapeseless masses and mixed with other minerals. It contains about 90 per cent of alumina, and a small portion of iron, is usually opaque, and about four times as heavy as water. It is very tough; is infusible, and is not attacked by acids. The best emery is brought from the Levant, and chiefly from Cape Emiri in Naxos, and from other islands of the Grecian Archipelago. It is also found in some parts of Spain, and is obtained from a few of the iron-mines in Great Britain. It is remarkable for its high degree of hardness, and it is this property which has rendered it an object of such request in various arts. It is employed by lapidaries in the cutting and polishing of precious stones; by opticians in smoothing the surface of the finer kinds of lenses, preparatory to their being polished; by cutlers and other manufacturers of iron and steel instruments; by masons in the polishing of marble, and in their respective trades by locksmiths, glaziers, and other artisans. For all these purposes it is pulverized in large iron mortars or in steel mills, and the powder, which is rough and sharp, is carefully washed and sorted into eight or ten different degrees of fineness, by passing it through sieves of a definite number of wires. The sifting is usually performed by those who use it, according to the description of work in which it is to be employed. Emery-paper and emery-cloth are made by laying a thin coat of glue upon the fabric, and dusting the emery from a sieve of the required size. It has also been made into cakes by mixing it with melted bees'-wax; a mixture of it with paper pulp has been used for razor-strops; and with vulcanized india-rubber for sharpening scythes and sickles.

EMETIC, a substance which is capable of exciting vomiting, independently of any effect arising from the mere quantity of matter introduced into the stomach, or of any nauseous taste or flavour. Emetics are employed in many diseases. When any morbid affection depends upon, or is connected with over-distension of the stomach, or the presence of acid, indigestible matters, vomiting gives speedy relief. Hence its utility in impaired appetite, acidity in the stomach, in intoxication, and where poisons have been swallowed. In the different varieties of febrile affec-

tions much advantage is derived from exciting vomiting, especially in the very commencement of the disease. Emetine, given in such doses as only to excite nausea, have been found useful in restraining hæmorrhage. The operation of vomiting is dangerous or hurtful in the following cases: where there is determination of the blood to the head, especially in plethoric habits; in visceral inflammation; in the advanced stage of pregnancy; in hernia and prolapsus uteri; and wherever there exists extreme general debility. The frequent use of emetics weakens the tone of the stomach, and should never be resorted to but in cases of extreme urgency. An emetic should always be administered in the fluid form. Its operation may be promoted by drinking any tepid diluent or bitter infusion.

EMETINE ($C_{10}H_{14}N_2O_8$) is a vegetable principle, obtained from *ipecaacuanha* root, of whose emetic properties it is conceived to be the cause. In a dose of half a grain it acts as a powerful emetic, followed by sleep; six grains produce violent vomiting, stupor, and death.

EMEU, or EMU, a bird akin to the cassowary. See CASSOWARY.

EMIGRATION, removal from one country to another, for the purpose of permanent residence. The impulse to leave the native country may spring from very different causes, the principal of which we shall endeavour to state. The prime cause is overpopulation. It must be borne in mind, however, that the mere statistics of inhabitants to a square mile are no index of excess of population. In this matter all depends not only on the extent and fertility of the soil, but on the labour and intelligence of the inhabitants, and on the social and political constitution. Emigration is often influenced by particular and temporary incidents, such as a bad harvest, an industrial crisis, a religious or political movement, the creation of a new colony, and more rarely by the desire to escape from laws which prohibit both marriage and the acquisition of land under certain circumstances, and from compulsory military service. The migrations of the barbarous ages admit of a very simple explanation; a tribe, after having exhausted the tract on which it had established itself, removed to a more tempting territory. Among the Greeks and Romans more complex influences were at work. The various states of ancient Greece possessed but a very limited territory, and whenever the population in any one of them increased beyond what the territory could easily nourish, a portion of the inhabitants was sent out to found an independent state. At Rome emigration was the consequence of the social and political institutions. In spite of the agrarian laws, which divided the land among the citizens, it soon fell into the hands of a few proprietors; and as the trades and professions were generally exercised by slaves, the majority of the free population had no source of income. Hence the numerous revolts, embittered by the ambition of the tribunes. The senate and the aristocracy endeavoured to get over the difficulty by giving the Roman citizens portions of conquered territory in Italy and elsewhere. These characteristics of emigration are not met with in the middle ages. On the one hand, Europe, after the fall of the Roman Empire and the conquest of the Asiatic invaders, did not suffer from overpopulation; and on the other, the feudal system confined the people to the glebe, or within the insuperable limits of a corporation. On the discovery of America the long stagnation of the population of Europe came to an end. At first love of adventure, of plunder, the tales of rich gold and silver mines, drew many to the New World; but as they intended to return to spend their wealth and remaining days at

home, they can scarcely be looked on as emigrants. Emigration, in its proper sense, to America, commenced with the departure of the Puritans who colonized New England; they were followed by the Germans, who settled principally in Pennsylvania; the Dutch colonized New York; the Swedes Delaware; the French Canada and Louisiana. Still the current of emigration was slow until 1815, when it acquired such magnitude and force that statesmen began to debate seriously its advantages and disadvantages. It was not long, however, till the logic of events proved it to be both irrepressible and advantageous. It was recognized that every fresh colony extended the national, political, and social influence; that they opened new markets for the productions of the mother country, giving at same time a fresh impetus to maritime trade, and that they formed safe outlets for an impoverished or overcrowded population. English statesmen were the first to see the inutility and danger in restraining the tide of emigration, and they either repealed or allowed to become obsolete the acts forbidding the emigration of various sections of the community. The British government now superintends emigration from the United Kingdom, endeavours to protect poor emigrants from imposition and from the effects of improvident arrangements on their part, and takes care that the provisions of the *Passengers Acts* are duly carried out and enforced. There is an *Emigrants' Information Office* in connection with the Colonial Office, established in 1886, for the purpose of supplying intending emigrants with useful and trustworthy information respecting emigration, especially to the British colonies. This office supplies information by means of cheap publications with regard to the obtaining of land in the colonies, the rate of wages to be obtained, the prices of food and clothing, the rates of passage-money, &c. It also affords all information possible to any person who may apply personally or by letter. The British government does not further assist emigrants, but the governments of some of the colonies have been in the habit of granting money to enable suitable persons in poor circumstances to emigrate to those colonies.

From England, Scotland, and Ireland a large emigration takes place to the United States, to Canada, Australia, Tasmania, New Zealand, Cape Colony, &c.; from Germany, Switzerland, Sweden, and Norway, to North America; from Italy to Argentina and the United States; Chinese emigrate to Australia, North America, Cuba, &c.; Indian coolies go to Mauritius and the West Indian colonies of Britain. It is estimated that since 1815 perhaps 80,000,000 of people have emigrated from Europe to foreign countries, about half of this number going to the United States. Statistical tables relating to emigration and immigration from and into the United Kingdom inform us that in the period extending from 1858 (when the nationality of emigrants was first distinguished) to 1899 inclusive, the total number of emigrants from the United Kingdom amounted to 8,695,931, of whom 5,782,654 went to the United States, 902,149 to British North America, 1,421,536 to the Australasian colonies, and 589,593 to other places. The total number who left the kingdom from 1815 to 1899 was 15,002,098. The nationality of the emigrants in 1899, as compared with 1877 and 1888, was as follows:—

	1877.	1888	1899
English.....	68,711	188,286	87,400
Scottish.....	8,668	31,136	16,977
Irish.....	22,531	108,743	42,580
Foreigners.....	81,280	73,880	90,020
Not distinguished..	3,467	2,770	4,814
Total.....	119,771	397,157	246,890

The destination of the emigrants who were natives of the United Kingdom and emigrated in 1897 is shown in the following table:—

	English.	Scottish	Irish
United States.....	45,531	9,121	52,822
W. American Colonies.....	18,442	1,381	848
Australian Colonies.....	10,396	1,082	683
South Africa.....	16,410	8,516	1,188
Other places.....	11,029	1,174	192

In 1888 the number of emigrants of British origin from the United Kingdom reached a maximum, namely, 820,118.

EMIGRÉS (emigrants). We meet in history with many instances of large bodies of men being obliged to leave their country on account of religious persecutions, as did the Huguenots, for instance, in the seventeenth century, or for some other causes. The appellation of *émigrés*, however, is now applied to those persons particularly who left France at the commencement of the first French revolution. These persons, some from enmity to the new order of things, others to escape political persecution, removed into the neighbouring countries, some with a little property, which they had found means to carry off, others entirely destitute. They were from all ranks, and of all ages and conditions. Most of them hoped to see the restoration of the old order, by which they might be enabled to return to their country, and therefore remained at first on the frontiers. Among them were seen examples of the basest profligacy and the most heroic self-denial. Persons who had been accustomed to all the luxuries of life, and the refinements of rank, earned a scanty subsistence in petty employments, and bore their privations with dignity and resignation. It would be unjust to call all those who left their country to its fate in the time of its greatest peril, weak and timid; for where anarchy rules the innocent is not secure. The emigration, however, of the royal princes can hardly be justified. Their presence was of great importance to the state, and their example contributed not a little to the extensive emigration which followed, and the injurious consequences which attended it. At the head of the emigrants stood the royal princes of Condé, Provence, and Artois, the first of whom collected a part of the fugitives to co-operate with the allied armies in Germany for the restoration of the monarchy. At Coblenz a particular court of justice was established to settle causes relating to the French *émigrés*. As a body, they are described by contemporary authors as haughty in their deportment towards foreigners, and acting as if they constituted the French nation, and as if the rest of Europe did nothing more than its duty in assisting them to recover their estates and feudal rights. But the invasion of the Netherlands by Dumouriez drove them from these provinces in mid-winter in a deplorable condition, while their number was daily increased by the system of violence and terror carried on in France. The corps of Condé was finally taken into the Russian service, and was disbanded in the Russian-Austrian campaign of 1799. When Napoleon became emperor it was one of his first acts of grace to grant permission to all but a few of the emigrants to return to their country. Many, however, who by this time had settled in foreign places, did not choose to avail themselves of the indulgence.

EMINENCE (from the Latin *eminentia*), an honorary title, like excellency, and given to cardinals. They were formerly called *illustrissimi* and *reverendissimi*; but Pope Urban VIII. (of the Barberini family), in 1680 established the above as their title of honour. Popes John VIII. and Gregory VII. gave this title to the kings of France. Emperors have borne it.

EMIR (i.e. noble, princely), a title of honour given in Turkey to those who claim descent from Mohammed and his daughter Fatima. These emirs are found—1. In Arabia, where they are the chieftains of the wandering tribes, or Bedouins. Their origin, however, is doubtful. 2. In Turkey itself they form a kind of hereditary nobility, and wear as a badge a green turban, as Mohammed is said to have done. They have certain privileges, but otherwise no higher claims to civil offices than other Mussulmans. The word *emir* is also applied to certain offices and employments, for example, *emir hadji*, conductor of the pilgrims to Mecca; *emir-akhor*, commander of the Turkish horse; *emir-bazar*, overseer of the markets, &c. The title *emir-al-mumenin*, commander of the faithful, was borne by the caliphs.

EMMERICH, a town, Rhenish Prussia, on the right bank of the Rhine, 5 miles N.W. of Cleves. It is inclosed by walls and ditches, contains several churches, a gymnasium, ecclesiastical seminary, and orphan hospital; and has manufactures of woollen and linen cloth, hosiery, leather, &c.; some shipping, and a free port, at which an active trade is carried on, chiefly with Holland. Pop. (1900), 10,517.

EMMET, ROBERT, a celebrated character in connection with the troubles in Ireland in the beginning of the nineteenth century, was born at Cork in 1780. He was originally intended for the bar, and with that view studied at Trinity College, Dublin, from which, however, in 1798, he was expelled, on the ground of exciting disaffection and rebellion. Subsequently to this he became an object of suspicion to the government, and accordingly quitted Ireland, but returned there again on the repeal of the suspension of the Habeas Corpus Act. He now became a member of the Society of United Irishmen, whose object was the chimerical idea of establishing the independence of Ireland. In July, 1803, he was the ringleader in the rebellion in which Lord Kilwarden and several other persons perished, but which was almost immediately suppressed. Emmet was arrested a few days afterwards, tried, and executed by a sentence of the royal commission. His fate excited considerable interest, from the circumstance of his attachment to Miss Sarah Curran, daughter of the celebrated barrister. Moore has immortalized his memory and that of Miss Curran in the beautiful song beginning, 'She is far from the land where her young hero sleeps.'

EMOLLIENTS, medicines of an oleaginous, saponeous, or emulsive character, applied to surfaces, generally external, to soften and relax their fibres, as poultices, fomentations, &c.

EMOTION, one of the threefold divisions of the human mind, the other two being volition and intellect. There are three distinct kinds of emotion; pleasure, pain, and an excitement that partakes of the nature of neither. It is a generally recognized fact that pleasurable emotions have a healthy physical effect, and those of pain an unhealthy one; also, that both kinds, when experienced in the intensest degree, have frequently proved fatal. Every strong feeling has a certain outward expression. Under violent emotion the whole muscles of the body may be affected, but in less extreme cases the expression is confined to the three centres of movement of the face—viz. the mouth, the eyes, and the nose; the first being the most expressive of the three. Besides the features, the voice is instinctively affected. The organic functions of the system are also considerably influenced under emotion; the flow of tears from the eyes under the pressure of joy or grief, the cold perspiration from the skin in cases of fear; the quickened circulation of blood, the increased or diminished respiration, are affected by similar causes. The emo-

tions of the human mind may be further classified under two heads—first, the modes of excitement arising from the exercise of the senses, the appetites, and muscular action; and second, those not directly springing from sensation, yet connected with it. See Bell's *Anatomy of Expression*; Darwin's *Expressions of the Emotions of Man and Animals*; Bain on the *Emotions and the Will*.

EMPANNEL, the entering of the names of the jurors returned by the sheriff to pass upon a trial, into a schedule, roll, or page of a book, called the *panel*.

EMPEDOCLE, a Greek philosopher, whose doctrines in many respects resembled those of Pythagoras, was born about 460 B.C. at Agrigento, in Sicily. His fellow-citizens esteemed him so highly that they wished to make him king; but being an enemy to all political forms which elevate a few above their fellows, he refused their offer, and prevailed on them to abolish aristocracy, and introduce a democratical form of government. The Agrigentines regarded him with the highest veneration, as the restorer and preserver of their liberty, the public benefactor, the great poet, orator, and physician, the favourite of the gods, the predictor of future events, and the mighty magician who could stop the course of nature, and overrule the power of death itself. Aristotle states that he died in obscurity, at the age of sixty years, in the Peloponneseus, but there are various legends respecting the manner and place of his death. He is said to have thrown himself into the crater of Mount Etna, in order to make it believed, by his sudden disappearance, that he was of divine origin. According to others, he was a victim to his rash curiosity, when, in order to examine more accurately the nature of the mountain, and of its fiery eruptions, he went too near the edge of the chasm and fell in. But it is probable that this is a fiction, as well as the story of Lucian about him, that his sandals were thrown out from the volcano, and thus the manner of his death ascertained. Others assert that he was drowned in his old age. Empedocles presented his philosophy in a poetical dress. His verses are marked by bold and glowing imagery, as well as by harmony and softness. Lucretius was his imitator. The iambic poem on the spheres, formerly ascribed to him, is now considered spurious. The best edition of his remains is that by Karsten (Amsterdam, 1838). Empedocles holds the four elements—earth, water, fire, air—as the fundamental and indestructible principles from whose union and separation everything that exists is formed. To these material principles are added the ideal principles of friendship and hatred.

EMPEROR (from the Latin *imperator*; in German, *Kaiser*, from *Cæsar*), the title of the highest rank of sovereigns. The word *imperator*, from *impero*, to command, had very different meanings among the Romans at different periods. In the most general sense, it signified the commander of an army. In early times consuls were called *imperatores* before they entered on their office. The soldiers afterwards conferred the title on their general, after a victory, by hailing him *imperator*: the senate also called a victorious general *imperator* until he had celebrated his triumph. At a still later period no one was honoured with this title who had not defeated a hostile army of at least 10,000 men. After the overthrow of the republic *imperator* became the title of the rulers or emperors, and indicated the supreme power; the word *rex* being too odious to be assumed. Victorious generals were still, however, sometimes saluted with the title *imperator*, in its original sense. With the fall of Rome the title was lost in the West, but was kept up in the Eastern or Byzantine Empire

for nearly ten centuries. In 800 it was first used in the West when Charlemagne was crowned, by Leo III., as 'Carolus Augustus, the God-sent pious and great emperor of Rome.'

On the division of the Frankish Empire among the sons of Louis-le-Debonnaire, Lothaire, king of Italy, received the title. Charles the Bald, and several princes of Italy, bore it until Otto I., in 962 A.D., finally united the imperial crown with that of the German kings. Yet it was for many centuries considered necessary to be crowned at Rome, in order to be formally invested with the title of emperor. For reasons too many to be enumerated here, the idea that the Bishop of Rome was the highest spiritual ruler, and the emperor of the holy Roman Empire (or of Germany), the highest temporal sovereign, was gradually developed. All the other states were regarded as dependent upon him. By several of the powerful sovereigns, however, this claim was never admitted; and the rulers of Castile, France, and England, without formally adopting the imperial style, maintained that their crowns were imperial, and their states empires.

The Eastern Empire having been finally overthrown by the conquest of Constantinople in 1453, the imperial dignity in the East became extinct. The sultans, who succeeded the emperors, have never received, in official language, the title of emperor. This title was adopted in Russia by Peter I. in 1721, but the right of the Russian sovereign to its possession was not acknowledged by the German Empire until 1747, by France in 1745, and by Spain 1759. Napoleon adopted the old idea of an empire, as a general union of states under the protection, or at least political preponderance, of one powerful state. Napoleon crowned himself as emperor in 1804; the title fell into disuse at his deposition in 1815, but was revived by his nephew in 1852, with whom it again ended on the 5th September, 1870. In 1806 the first German Empire, 1000 years old, became extinct, and the German Emperor, Francis II., adopted the title of Francis I., emperor of Austria. In December, 1870, the second German Empire was formed, King William of Prussia having accepted the imperial office and title offered him at Versailles while engaged in the siege of Paris.

Great Britain is considered as an empire, the crown as imperial, and the Parliament is styled the *Imperial Parliament of Great Britain and Ireland*; but the sovereign has not the imperial title in reference to the home dominions, though the King bears the title of Emperor of India. The sovereigns of China, Japan, and Morocco are often, though with little propriety, called *emperors*.

EMPEROR MOTH (*Saturnia pavonia minor*), one of the most beautiful species of British moths. The colour is grayish-brown, with a faint purple tinge. The wings are about 3 inches in expanse, the hinder margin of each having a band of pale-brown and purple. In the centre of each wing, on a light ground, is found a large eye-like glassy and transparent spot, consisting of a black pupil, with a yellow or gray iris, and partly surrounded by a light blue crescent. The larva is of a green colour, with a black band on each segment. The cocoon is not close at the extremity, but terminates in a converging circle of elastic hairs, which enables the insect to escape from it, but effectually prevents the invasion of intruders. This moth belongs to the same family as the silk-worm.

EMPHASIS, in rhetoric, a particular stress of utterance or force of voice given to the words or parts of a discourse, whose signification the speaker intends to impress specially on his audience, or a distinctive utterance of words specially significant, with

a degree and kind of stress suited to convey their meaning in the best manner. In writing the emphatic word or phrase is usually underlined; in printing a different kind of type is used, commonly the *italic* character called *italic*.

EMPIRIC, in medical history (from the Greek word *empeiria*, experience), an appellation assumed by a sect of physicians who contended that all hypothetical reasoning respecting the operations of the animal economy was useless, and that observation and experience alone were the foundation of the art of medicine. Empiric, in modern medicine, is applied to a person who sells or administers a particular drug or compound, as a remedy for a given disorder, without any consideration of its different stages, or degrees of violence, in different constitutions, climates, or seasons. For empiric philosophy, see **EXPERIMENTAL PHILOSOPHY**.

EMPOLI, a town in Tuscany, Italy, on the left bank of the Arno and the railway to Leghorn, 16 miles w.s.w. of Florence. It consists of several good squares and narrow streets, and the town proper is inclosed by walls. The principal edifices are an ancient collegiate church, with a fine façade and some good paintings, another church with some good frescoes, and an old palace. The manufactures consist chiefly of straw bonnets, beaver hats, and vases; and the weekly market is important. Pop. 6500.

EMPYREUMA (*empyreuma*, a gathering coal; *pyr*, fire), the smell acquired by organic matter when subjected to the action of fire, but not enough to carbonize it entirely. The products of imperfect combustion, as from wood heated in heaps or distilled in close vessels, are frequently distinguished as *empyreumatic*.

EMS, a celebrated watering-place in the Prussian province of Heese-Nassau, on the river Lahn. The environs are beautiful. As early as 1583 it was used as a watering-place. The mineral waters at Ems are warm—from 70° to 118° Fahr.; they are of the saline class, containing large quantities of carbonic acid gas, and are used with much effect in chronic catarrhs, pulmonary complaints, diseases of the stomach arising from phlegm and acidity, gout, and some diseases of the urinary vessels. About 800,000 bottles of the water of Ems are sent away annually, and the number of visitors amounts to about 10,000 each season. It was here that the memorable interview between the King of Prussia and the French ambassador, Benedetti, took place which formed the prologue to the Franco-Prussian war of 1870-71. Pop. (1895), 6222.

EMS, a river of Germany, which rises at the south-east extremity of the Teutoburger-Wald, in Lippe-Deilmold, flows north-west, first through Rhenish-Prussia, and then through Hanover, and falls into the Dollart, near Emden; length 234 miles. It is navigable as far as Papenburg for vessels drawing 18 feet of water. In 1818 it was connected by a canal with the Lippe, and thus with the Rhine, and its importance has been greatly increased by the opening of the Dortmund-Ems and other canals.

EMU. See **CASSOWARY**.

EMULSINE, or **STNAPTASE**, a nitrogenous body discovered by Liebig and Wöhler in the course of their researches on amygdalin and on the formation of essential oil of bitter almonds. When sweet or bitter almonds are pressed a large quantity of an oil is obtained, of no particular taste or odour. If the cake which remains be macerated with water and distilled, nothing is obtained from sweet almonds; but an essential oil, with characteristic odour and taste, and poisonous, is got from bitter almonds. If, however, before macerating the bitter-almond cake, it be extracted with alcohol, it loses its power of

yielding an essential oil, while the alcoholic extract on evaporation deposits a crystalline substance called amygdalin, to which the taste of the bitter almond is due. Now on adding amygdalin to cold emulsion of sweet almonds the essential oil is produced, showing that the oil is connected in some manner with the bitter principle. Again, if the almond cake, whether sweet or bitter, be mixed with three or four times its weight of water, and pressed, an emulsion is obtained, which on standing separates into an upper creamy, and a lower transparent stratum. If the lower stratum be treated with alcohol a precipitate is formed, which, when washed with alcohol and dried in a vacuum, forms a white opaque friable mass, soluble in water with an acid reaction, and which very soon putrefies. Its composition is unknown, but it contains nitrogen and a quantity of mineral matters. This is emulsine, and when added to amygdalin, as prepared above, in presence of water it at once decomposes it into essential oil of bitter almonds. It is this reaction which takes place on macerating the bitter-almond cake, but does not occur with the sweet, since although it contains emulsine, the decomposing agent, it contains no amygdalin to be decomposed. In the course of the reaction there are produced, besides the oil, glucose and prussic acid, which is the cause of the poisonous character of the oil. Emulsine is supposed to act after the manner of a ferment; if dry, it may be heated to 212° without loss of power, but by contact with boiling water its activity is destroyed. Emulsine also seems to be unable to decompose amygdalin in the stomach.

EMULSIONS, a term applied to the imperfect solutions of the fixed vegetable oils in water. They are obtained by rubbing the seeds affording these oils with water, to which a little sugar has been added.

ENAMELLING (from *enamel*, formed by a junction of the inseparable particle *en*—borrowed by us from the French, who had taken it from the Latin *in*—and the old English word *amel*, taken from the *email* of the French, both signifying the material used in overlaying the variegated works which we call *enamelled*), the art of variegating with colours laid upon or into another body; also, a mode of painting, with vitrified colours, on gold, silver, copper, &c., and of melting these at the fire, or of making curious works in them at a lamp. This art is of so great antiquity as to render it difficult or impossible to trace it to its origin. It was known to the Assyrians, who used antimony, lead, oxide of tin, and copper to produce yellow, white, and blue glazes, the red being formed by suboxide of copper—the very substances, in fact, which are employed at the present day. It was also practised by the Egyptians, as is evident from the remains that have been observed on the ornamented envelopes of mummies. From Egypt it passed into Greece, and afterwards into Rome and its provinces, whence it was probably introduced into Great Britain, as various Roman antiquities have been dug up in different parts of the island, particularly in the barrows, in which enamels have formed portions of the ornaments. The gold cup given by King John to the corporation of Lynn, in Norfolk, proves that the art was known among the Normans, as the sides of the cup are embellished with various figures, whose garments are partly composed of coloured enamels. The art of enamelling reached its greatest perfection in the sixteenth century in Flanders, whence enamelled ware was called *faience*, and it was at this time that Palissy made his independent discovery of the process. Enamels are vitrifiable substances, and are usually arranged in three classes; namely, the transparent, the semitransparent, and opaque. The basis of all kinds of enamel is a perfectly transparent and fusible glass, which is re-

dered either semitransparent or opaque by the admixture of metallic oxides. The art of colouring glass seems to be of nearly the same antiquity as the invention of making it, which is proved not only from written documents, but likewise by the variously coloured glass corals with which several of the Egyptian mummies are decorated. White enamels are composed by melting the oxide of tin with glass, and adding a small quantity of manganese to increase the brilliancy of the colour; sometimes phosphate of calcium, or simply ground bones, are used. The addition of the oxide of lead, or antimony, produces a yellow enamel, but a more beautiful yellow may be obtained from the oxide of silver. Reds are formed by copper, and by an intermixture of the oxides of gold and iron, that composed of the former being the most beautiful and permanent. Greens, violets, and blues are formed from the oxides of copper, cobalt, and iron; and these, when intermixed in different proportions, afford a great variety of intermediate colours. Sometimes the oxides are mixed before they are united to the vitreous bases. All the colours are produced by the metallic oxides. The principal quality of good enamel, and that which renders it fit for being applied to baked earthenware, or to metals, is the facility with which it acquires lustre by a moderate heat, or cherry-red heat, more or less, according to the nature of the enamel, without entering into complete fusion. Enamels applied to earthenware and metals possess this quality. Enamels are executed upon the surface of copper and other metals by a method similar to painting. Enamelling on plates of metal, and painting with vitrifiable colours on glass, are practised with great success in England. Enamelling has also been executed, on a comparatively large scale, in the manufacture of pots, pans, and other utensils for domestic use. The vessel is made of iron, and then after thorough cleansing with dilute sulphuric acid and water, the enamel, consisting of kaolin, or potter's clay, ground flints, and borax ground very fine, is laid on with water, and dried, and then the glaze is spread and the article subjected to heat in a muffle. Different materials are used for the body and for the glaze, metallic oxides, tin, antimony, or lead sometimes being added. The presence of these substances is objectionable in culinary vessels, as in some cases they may be attacked by acetic and other vegetable acids. Good enamelled vessels, free from lead, are tolerably permanent, and very easily cleaned. Enamelling in colours upon iron by stencilling has been employed for advertising and for sign-boards.

Photographic enamelling is effected on collodion sensitized with bichromate of ammonium and gum or honey, by dusting over the picture the enamel powder. The part not affected by the light retains the powder by its hygroscopicity, while the affected parts retain less or more of it, and produce the lights and shades; the film is then applied to the object to be enamelled, the collodion destroyed by sulphuric acid, and the piece is finally heated in a muffle. The process has been very successful.

ENARA, a lake, Russia, in the north of Finland, of a tolerably regular and nearly rectangular form, about 50 miles long, south-west to north-east, and 30 miles broad. It is studded by almost innumerable islets, receives several streams, of which the Ivalo, which joins it on its south shore, is the most important, and discharges itself by the Patjoki into the Arctic Ocean. At its south-west extremity is a small town of same name, which is inhabited chiefly by fishermen, and has an annual fair of some importance.

ENAREA, a country of the Gallas, south from Abyssinia, between lat. 7° and 8° N.; and lon. 85° and 87° E. In the valley of the Gibbi, immediately beyond

Sakha, the chief town and emporium of the country, are extensive plantations of coffee, which, along with ivory, is largely exported. The inhabitants are the most civilized of the Gallas, and show much skill in manufactures.

ENCAAMPMENT. See CAMP.

ENCAUSTIC PAINTING (Greek. *enkausein*, from *enkaisin*, to burn in). Painting in encaustic is executed with the operation of fire. Ancient authors often mention this species of painting, which, if it had been described simply by the word *encaustic*, might be supposed to have been a species of enamel painting. But the expressions *encausto pingere*, *pictura encaustica*, *ceris pingere*, *picturam insuere*, by Pliny and other ancient writers, show that another species of painting is meant. We have no ancient pictures of this description, and therefore the precise manner adopted by the ancients is not completely understood, though many moderns have closely investigated the subject, and described their processes.

Pliny, in a passage relating to encaustic painting, distinguishes three species. It has been supposed that the first species consisted of spreading wax mixed with as much earth colour, finely powdered, as it could imbibe, on wood or on a wall, by means of a hot spatula. When the coating became cold, the designer cut the lines with a style or graver. Another and more probable explanation of this species is that by means of the style the colours mixed with wax were laid on to the prepared ground of the panel, and then blended by a hot iron. But inustion, as the final burning in is technically called, formed, it seems, an essential part of the process. The second species was probably a kind of intaglio. The outlines, first drawn on waxed ivory (for facilitating any necessary correction), were afterwards engraved in the substance, and the finished and shadowed design was filled in with the desired number of colours; and lastly, covered with a wax varnish. The third mode was the application of the colours with the brush or pencils. It is generally believed that the wax was dissolved, probably by means of an essential oil, the colours mixed with it, and laid on with a brush, and the painting then finished by a careful subjection to heat. For this purpose a hot iron, or a pan of coals (*cauterium*) was used.

As the thing chiefly regarded in encaustic painting was the securing of permanence and durability, by the application of fire, the word *encaustic* has been applied, in a very general sense, to other processes, in which both the material and the mode of applying the heat are entirely different from the ancient materials and modes. The word has been used, not only of wax-painting on wood, stone, and ivory, but also of painting on earthen vessels, of works in metal, where gold and silver were inlaid, melted, or laid on, and of everything which was gilt or silvered by fire; which was called *gold* or *silver encaustic*. The moderns have also used the term for painting on porcelain, and work in enamel; and in the same way it was given to the painting on glass of the middle ages, such as is now seen in the windows of many Gothic churches. It is evident that all these have nothing to do with the wax-painting of the ancients.

ENCAUSTIC TILES, a species of ornamental tiles made of a finer kind of clay than the ordinary tiles, but not so fine as porcelain. These are of two sorts: plain and figured. The plain tiles are sometimes square, but more frequently triangular, and of different colours; the latter shape renders possible a greater number of designs when the tiles are employed in a sort of mosaic work for the paving of churches, halls, &c. They are made by putting the coloured clay into strong steel moulds and subjecting it to a pressure of several hundred tons, by means of

a plunger fitting accurately into the mould. The under surface of the tile is usually ribbed in order to afford a better hold for mortar. The clay for figured tiles is pressed into an iron mould, the bottom of which is formed of a plaster of Paris pattern, bearing the desired design. The pattern being removed, the depressions on the surface of the tile are filled with coloured clays, and the surface is then shaved to remove all superfluities and ruggedness, leaving the pattern intact. The tile is then dried for two or three weeks, and finally fired by being exposed to an intense heat for sixty hours.

ENOCHTE, in fortification, the continuous line of works which forms the main inclosure of a town or fortress. The term is also applied to the area within this line.

ENCHANTMENT, a term applied to magical verses chanted or sung by sorcerers, in which instance it is synonymous with charm (Latin, *carmen*, a song), but afterwards used to denote any of the various means by which the magician impressed his will upon external nature; also the effect so produced. The word is frequently used figuratively, to signify an intense degree of pleasure, produced by the grand and beautiful in nature or art.

ENCHASING. Enchasing, or chasing, is the art of enriching and beautifying gold, silver, and other metallic articles by ornamental designs or figures represented thereon in low relief or in intaglio. It is an operation, or finishing process, performed on a great variety of figured works of plate or jewelry. Some writers in treating of the subject apply the term more especially to the finishing of raised designs by means of the chisel, graver, or other tool. In this narrower sense, it is the final process applied to embossed or repoussé work; but the term is also used to include the embossing process, and it thus embraces the operation of punching or pressing out the metal to form the main lines of the figures, by making them stand out from the plane or surface of the metal. The workman is furnished with a number of fine steel blocks, and punches of divers forms and sizes, and the general forms having been already impressed upon the surface of the metal, the blocks are applied inside or underneath, directly below or behind the parts to be finished off; while, by striking externally with a punch and a fine steel hammer, the metal is made to yield and receive any form which the workman wishes to communicate. Thus he proceeds, in succession applying his blocks, punches, and hammers to the several parts of the design; and if he be a good artist, it is surprising how much beauty and delicacy he will be able to impart.

ENCHORIAL, or **ENOCHORIC** (from the Greek *en*, in, and *chōra*, country). The Egyptians employed different alphabets in writing—hieroglyphic, hieratic (used by the priests), and enchorial (used for the common purposes of life, and hence called also *epistolo-graphic* and *demotic*). Thus, on the Rosetta stone there are three inscriptions, one in the hieroglyphical character, one in what the Greeks called *enchōria grammata*, and one in Greek characters. Enchorial is Dr. Thomas Young's name for these popular characters; M. Champollion calls them *demotic*. See **HIEROGLYPHICS**.

ENCKE, JOHANN FRANK, a German astronomer, born at Hamburg, 28d Sept. 1791. His first studies were directed by his father, who was the pastor of the church of St. James, in that town. He then studied under the astronomer Gauss, at Göttingen. During the war of Liberation (1813-15) he served as artilleryman in the German army, and on the conclusion of peace was appointed assistant in the observatory of Seeberg, near Gotha. Here he calculated

the orbit of the comet observed by Mechain, in 1786, by Miss Herschel in 1795, and by Pons in 1805 and 1818. He predicted its return in 1822, 1826, and 1828, and with skill re-appearance more elements were afforded for computing its exact orbit, which, it was calculated, required three and a quarter years to complete. By comparison of the times of its earlier and later appearances, Encke was subsequently led to detect a gradual acceleration of its movement, amounting to about two and a half hours on each revolution. This acceleration he ascribed to a resisting medium, which sensibly affects a body of the extreme rarity of this comet, which is transparent to its centre. The fame of his two publications, *Die Entfernung der Sonne* (Gotha, 1822), and *Der Venusdurchgang von 1769* (Gotha, 1824), led to his appointment as director of the observatory of Berlin (1825), a position which he held till his death in 1865. Many of his works are contained in the *Astronomische Jahrbücher* (1830-66), a publication which was, during these years, issued under his direction.

ENCLAVE, a term used in German and French, to denote a place or country which is entirely surrounded by the territories of another power. Thus several petty duchies and principalities are enclaves of Prussia.

ENCORE, a French word, signifying again, used by the audiences in English theatres or concert-rooms, as a request to repeat a performance of a piece of music. The French themselves do not use the term in such circumstances, employing in its stead the word *bis* (twice).

ENCYCLOPEDIA, **CYCLOPEDIA**, or **CYCLOPEDIA**. This word, formed from the Greek *en*, in, *kullos*, a circle, and *paideia*, instruction, but not a native Greek compound, originally denoted the whole circle of the various branches of knowledge which were comprehended by the ancients in a liberal education (the *artes liberales* of the Romans). The distinction between the words *encyclopædia* and *cyclopædia* is almost too nice to be comprehended. At a later period the word was applied to every systematic view, either of the whole extent of human knowledge or of particular departments of it. The want of such general surveys was early felt; and as knowledge increased they became still more desirable, partly for the purpose of having a systematic arrangement of the sciences in their mutual relations, partly for the reader finding of particular subjects; and, for these two reasons, such works were sometimes philosophically, sometimes alphabetically arranged. The spirit of compiling, which prevailed in the Alexandrian school, soon led to attempts remotely allied to this, and Varro and Pliny the elder, among the Romans, composed works of a similar kind (the former in the lost works, entitled *Rerum humanarum et divinarum Antiquitates*, and *Disciplinarius Libri IX.*, the latter in his *Historia naturalis*). To these may be added the later collections of Stobæus and Suidas, and especially of Marcianus Capella. These, however, were only preparatory labours.

The honour of undertaking encyclopædias on a regular plan belongs to the middle ages, which, with iron industry, produced not only a large number of cyclopædias of particular sciences, called *Summe* or *Specula* (for example, the *Summa Theologie* of Thomas Aquinas), but also a Universal Encyclopædia, such as had never been seen before. The indefatigable Dominican, Vincent of Beauvais, about the middle of the thirteenth century, exhibited the whole sum of the knowledge of the middle ages in a work—or rather three works—of considerable size (*Speculum historiale*, *naturale*, *doctrinale*), to which an anonymous author added, some years later, a *Speculum morale*, in a similar form, in extracts from the works

of the writers of the time;—a real treasure to the inquirer into the literary history of the middle ages. An exceedingly popular work was the *De Proprietatibus Rerum* of Bartholomæus de Glanvilla, an English Franciscan friar, which maintained its reputation from the year 1360 to the middle of the sixteenth century. In the seventeenth century various encyclopædic works were compiled, such as the Latin one of John Henry Alsted (*Encyclopædia vii Tomis distincta*, Herborn, 1620), a work in which the subjects are divided into seven classes, and treated in thirty-five books. In 1674 appeared the first edition of Moréri's *Le Grand Dictionnaire Historique*. In 1677 John Jacob Hoffman published at Basel his *Lexicon Universale*, the first work of the kind in which a summary of art and science was presented in dictionary form. In 1697 appeared Bayle's famous *Dictionnaire Historique et Critique* (Rotterdam, 4 vols.), a work which is still of great value. Among the greatest works of earlier date would have been reckoned the *Bibliotheca Universale* of Coronelli, had it been completed according to the original plan. It was to have appeared in forty-five folio volumes, of which only seven were published (Venice, 1701-6). More successful, especially in being brought to a completion, was the *Grosses vollständiges Universallexicon aller Wissenschaften und Künste* (Grand Universal Lexicon of all the Arts and Sciences), commonly called Zedler's, from the person, a bookseller, who conducted it (Halle and Leipzig, 1732-50, sixty-four vols.; Supplement, 1751-54, four vols. folio). It has, on the whole, much merit. Lives of living men were included after volume xviii.

The first encyclopædia written in English, and with the articles alphabetically arranged, was the *Lexicon Technicum*, or an Universal English Dictionary of Arts and Sciences (London, 1704, one vol. folio), by John Harris, a London clergyman. This was a useful and popular work, though it omitted from its scope theology, biography, antiquity, and poetry. It was reprinted in 1708, and a second volume was added in 1710. Among other important encyclopædic works in English the following may be mentioned: 1. Ephraim Chambers's *Cyclopædia*; or an Universal Dictionary of Arts and Sciences—a work published in 1728, in two vols. folio. A second and improved edition came out in 1738, and five other editions were published between 1739 and 1752 (besides one at Dublin), while it was also translated into Italian. Latterly it was revised and enlarged by Abraham Rees, in which form it was several times reprinted, being finally known as Rees' *Cyclopædia*, and published in a number of volumes. 2. *Encyclopædia Britannica*. Of this there have been nine editions. The first edition was completed in 1771, in three vols. 4to; the fourth in 1810, in twenty vols. 4to; the fifth in 1815; the sixth in 1823; the seventh, twenty-one vols., commenced in 1830, was finished in 1842; the eighth, in twenty-five vols., between 1853 and 1860; while a ninth, having been begun to be published in 1875, was completed in 1889 in twenty-four vols., and an index vol. 3. Edinburgh *Encyclopædia* (1810-30, eighteen vols. 4to). This work was devoted particularly to the sciences and technology, and was conducted by Sir David (then Dr.) Brewster. 4. *Encyclopædia Metropolitana* (London, begun in 1815, completed in 1845, in twenty-five vols. 4to, with three additional volumes of plates and one of index). This was published in four divisions, according to a plan devised by the poet Coleridge. It contains some valuable complete treatises, such as Whately's *Logic and Rhetoric*. 5. The London *Encyclopædia*, by Thos. Curtis (twenty-two vols. 4to; London, 1829). 6. The

Penny *Cyclopædia*, in twenty-nine vols. small folio, 1833-46. A modern recast of this cyclopædia has been published under the name of the *English Cyclopædia*. It is in four divisions, viz. Arts and Sciences, eight vols.; Biography, six; Geography and Natural History, four vols. each; and was published between the years 1854 and 1861, several supplementary volumes having afterwards appeared. 7. Chambers's *Encyclopædia*, in ten vols. large 8vo, published between 1860 and 1868, a new edition of which was begun in 1888 and finished in 1892. We should also mention Appleton's excellent *American Cyclopædia* in sixteen vols. (New York and London, 1858-63; latest edition 1881); and Johnson's *Universal Cyclopædia* (also American), four vols. 1874-77, and eight vols. 1895. Besides these a number of smaller cyclopædias have been published.

Of the French cyclopædias the most famous is the great *Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts, et des Métiers*, by Diderot and D'Alembert (see next article). Still more comprehensive is the *Encyclopédie Méthodique, ou par Ordre des Matières* (Paris, 1781-1832, in 186½ vols. 4to, besides volumes of plates), an aggregate of dictionaries rather than a single work. The French have also the *Encyclopédie Moderne*, begun in 1824, finished in 1832, twenty-six vols., and subsequently republished; the *Encyclopédie des Gens du Monde* (1835-44), twenty-two vols.; Larousse's more recent and valuable *Grand Dictionnaire Universel du XIX. Siècle*, sixteen vols. folio (with two supplementary volumes), and *La Grande Encyclopédie*, an extensive and excellent work now in course of publication. Of works published in Germany the most famous is Brockhaus' *Conversations Lexikon*, now in its fourteenth edition. It is equalled, if not surpassed, by the similar work of Meyer. The huge *Allgemeine Encyclopadie der Wissenschaften und Künste*, originally edited by Professors J. S. Ersch and J. G. Gruber, begun in 1818, is not yet completed. Three sections of the alphabet are carried on simultaneously. Other German encyclopædias deserving mention are those of Pierer and Spamer. Similar works have also been published in Italy, Spain, Holland, Denmark, Norway, Sweden, Russia, &c.

The rapid advancement of the sciences and arts, and the proportionally rapid communication between all civilized nations, have made a general acquaintance with many different branches of knowledge more necessary than ever before. This is one of the chief causes which have produced in our time so many encyclopædias of various kinds, some very learned, and others more adapted for the general reader; some embracing all the sciences and arts, others only single branches.

ENCYCLOPÉDIE, THE FRENCH. The term *encyclopædist* is used, particularly in French literature, to signify those who were engaged in the great encyclopædia mentioned in the preceding article, projected by Diderot; and it is applied also to those who joined themselves to their party in philosophy and criticism. As Diderot took a lively interest in everything worth knowing, he could not confine his literary labours to a single department. The articles connected with arts and manufactures and the history of ancient philosophy were undertaken by him, as well as the responsible duties of editorship. Some of his most notable colleagues were D'Alembert (who wrote the famous *Discours Préliminaire*) for mathematics; Rousseau wrote the musical articles; Dabenton, those connected with natural history; the Abbé Yvon, those on logic, metaphysics, and ethics; Toussaint, those on jurisprudence; Buffon contributed the article *Nature*; and Montesquieu and Voltaire took some share in the great work.

In the philosophical and critical articles the peculiar sentiments of the writers of the *Encyclopédie* were received by the French public as the oracles of truth; and it became easy for the encyclopedists to give currency to what they called *philosophy*. They had also a great influence on the literary taste, not only of the French, but of other nations. Polished correctness, elegance of style, with an imitation of nature and a moral design, were the highest excellences which they saw in art, and the great objects of attainment. As they made the understanding the sole judge of poetry, which was therefore to be the cool product of reflection, their views, by means of the authority which they had acquired, tended extremely to cramp the genius of the French in respect to works of imagination, and to destroy all boldness and freedom. They gained a still greater authority by their philosophy, just suited as it was to the prevailing spirit of the French people. Indeed, there is hardly an instance to be found in which the literature of a nation have obtained so extensive and powerful an influence on political sentiment as the French literature, and particularly the French encyclopedists. Their philosophy, too, was a fashionable philosophy, a philosophy for common life, favourable to wit and gaiety. This mixture of philosophy with elegant literature became still more interesting on account of the opinions which men like Mably, Condillac, Mercier, Raynal, Buffon, Helvetius, Diderot, and D'Alembert advanced on the subjects of religion and civil government; for which a prohibition was laid on the further progress of the work. But the printers only, and not the authors, were punished, and the government was soon after obliged to permit the work to proceed, as it was too weak to prevent it. To the encyclopedists, who were connected with the highest circles of that time, is justly attributed a very important influence on the French revolution.—This great work bore the title of *Encyclopédie, ou Dictionnaire raisonné des Sciences, des Arts et des Métiers*, par une Société de Gens de Lettres, mis en Ordre par Diderot, et quant à la Partie mathématique par D'Alembert (Paris, 1751-72, twenty-eight vols. fol.; Supplement, Amsterdam, Paris, 1776-77, five vols. fol.; Table des Matières, Paris, 1780, two vols. fol.; in all thirty-five volumes; also, at Geneva, 1777, thirty-nine vols. 4to; Lausanne and Berne, 1778-81, thirty-six vols. 8vo, three 4to vols. engravings).

ENDEMIC (from Greek *en* and *demos*, prevailing among the people). This name is often applied to diseases which attack the inhabitants of a particular district or country, and have their origin in some local cause, as the physical character of the place where they prevail, or in the employments, habits, and mode of living of the people. Every part of the world, every climate, and every country, has its peculiar endemics. Thus the tropical and warm climates are subject to peculiar cutaneous disorders, eruptions of various kinds, because the constant heat keeps up a strong action of the skin. In northern climates eruptions of the skin occur, but they are of a different kind. Thus in all the north countries, especially in Norway, a kind of ity, the *rodsyge*, is prevalent, arising from the cold and humidity of the climate, which disposes the skin to such disorders. Hot and moist countries generate the most violent typhoid and putrid fevers; the West Indies and some of the American resorts, for instance, produce the yellow fever. Places in a more dry and elevated situation, northern countries particularly, are peculiarly subject to inflammatory disorders. In countries and districts very much exposed to currents of wind, especially in mountainous places, we find at all seasons of

the year, rheumatisms, catarrhs, and the whole train of complaints which have their origin in a sudden stoppage of the functions of the skin. In large and populous towns we meet with the most numerous instances of pulmonary consumption. In places that are damp, and at the same time not warm, for example, on marshes and large rivers, intermittent fevers are prevalent. In cold and damp countries like England, Sweden, and Holland the most frequent cases of croup occur.

Diseases which are endemic in one country may also appear in others, and become epidemic if the weather and other physical influences resemble those which are the causes of the endemic in the former place; the climate being for a time transferred, as it were, from one to the other. Thus, for instance, we find the croup sometimes during wet and cold weather appearing in high situations; intermittent fevers sometimes in places where they occur rarely for years, and then again attack great numbers; putrid and malignant fevers rage in all countries occasionally, and so of the rest.

Endemic disorders in some circumstances become contagious, and thereby spread to other persons, and may be transplanted to other places, the situation and circumstances of which predispose them to receive these disorders. This is known by the sad experience of the migrations of diseases, the spreading of the leprosy from the oriental countries to Europe, &c. It is useful to inquire into the endemical circumstances of countries, districts, and even cities and towns; some precautions may be thereby suggested to escape the sickness, or to obviate the unwholesomeness of the situation of the place in question. As, for instance, the physician of Pope Clement XI., Lancini, procured the draining and drying of the marshes about Pesaro, and the diseases which had arisen from the exhalations of these marshes immediately ceased. It is also very favourable to the cure of obstinate disorders for the invalid to remove to a climate where his particular complaint is rare. Thus it is customary for people attacked with pulmonary complaints to remove to localities where the air is pure and dry, and there is plenty of sunshine. So it is of advantage to the consumptive to exchange the unwholesome city air, full of dust and fine particles of various kinds, for the pure air of the country. And so of other disorders.

ENDIVE. See CHICORY.

ENDLESS SCREW, a mechanical contrivance, consisting of a screw, the thread of which gears into a wheel with skew teeth, the obliquity corresponding to the angle of pitch of the screw. It is generally employed as a means of producing slow motion, in the adjustment of machines, rather than as transmitter of any great amount of power.

ENDLICHER, STEPHEN LADISLAUS, born at Presburg in 1804, was educated in the gymnasium there, and afterwards studied partly at Pesth and partly at Vienna, where he entered the archiepiscopal seminary and prepared to take orders. He had even completed his theological studies and taken the preparatory steps, when in 1826 circumstances of a family nature induced him to return to secular life. Two years after he obtained an appointment in the court library at Vienna, and was secured by his parents in a comfortable independency. He now engaged very zealously in the study of natural science, particularly botany, and that of the oriental tongues, particularly the Chinese. As a botanist he soon acquired a name, which procured him the appointment of conservator in this department of the Vienna Museum. In 1840 he was appointed professor of botany in the University of Vienna. As

the same time he was made director of the botanic garden, which he immediately began to reorganize. The Vienna Academy of Sciences owes its existence to the combined efforts of Endlicher and Hammer-Purgstall. He took part on the popular side in the German revolution of 1848, and, driven to despair by the intrigues of his enemies and pecuniary embarrassments produced by his excessive liberality in the cause of science, he is said by some to have died of a broken heart, and by others by his own hand, in 1849. A simple enumeration of his writings would suffice to prove his unwearied assiduity and the vast extent of his acquirements. Among others may be mentioned his *Examen Criticum Codicis Quatuor Evangeliorum Byzantino-Corviniani*; *Flora Pannoniensis*; *Sertum Cabulicum*, drawn up in concert with Fenzl; *Grundzüge einer neuen Theorie der Pflanzenzeugung*; *Enchiridion Botanicum*; *Anfangsgründe der Chines. Grammatik*, and *Reum Hungaricarum Monumenta Arpadiana*. All the works of Endlicher are distinguished by depth and originality of thought.

ENDOGENOUS PLANTS, an older name for monocotyledons, referring to the mode of growth of the stem. See **BOTANY**.

ENDOSKELETON, EXOSKELETON. These are convenient terms for certain obvious features, but they are inexact, and have not yet lost their primitive meaning, so as to become purely symbolical of certain anatomical generalizations. They are commonly used in contrast, an endoskeleton as the characteristic possession of a vertebrate animal, an exoskeleton of an invertebrate animal. The former consists of the cartilaginous and osseous framework, the latter of the hardened investments of the body, as the solid chitinous covering of beetles, or of the solid structures which, like the shells of molluscs, are secreted by the outer integumentary layers. The functions of a skeleton are—1. To protect the soft parts; 2. To give support to the body in locomotion; 3. To afford fixed points on which the muscles act in moving the limbs. When vertebrate and invertebrate animals are compared, the difference as regards the skeleton is less important than at first sight appears; it is, in fact, one of degree rather than kind. The vertebral column is not essential to a vertebrate animal if by it is meant a chain of bones articulated to each other, for the lancelet (*Amphioxus*) has a fibrous structure in this position; the essential character of a vertebrate is the partition which separates the spinal canal from the cavity of the abdomen and thorax, not the bones which may be developed in it. Moreover, in the ascidians, or tunicated molluscoids, a structure similar in character to that of the lancelet is found. The skull, or skeleton of the head in a vertebrate, has its analogue in the cartilaginous box which protects the chief nervous ganglia and sense organs of the cuttle-fish; while in the crab and other crustaceans, as well as in the spiders, the chain of ganglia on the under surface of the body is protected by a series of calcareous rods projecting inwards from the integument, and forming a canal of trellis-work. In the soft-bodied worms, and in insects, the muscles are attached by both ends to the inner surface of the integument; but in crustaceans, structures analogous in function to the bones of vertebrates are found in the limbs, projections inward from the integument of one joint which pass into the cavity of the next joint nearer the body, and thus act as levers by which the more distant joints are moved. In mammals there are muscles attached at both extremities to skin, thus the *panniculus carnosus* or broad sheet of muscle by which the hedgehog draws its spiny hood over its head and limbs, the smaller sheet by which the horse twitches insects

and sometimes its rider off its back, and the muscle which in man represents the last reduction of this sheet, and helps to draw the corner of the mouth downward. These are all cutaneous muscles. Nor is an exoskeleton, in the popular sense, wanting among vertebrates; the scales of some fishes are bony plates, those of the sturgeon being very ornamental; the tortoise and turtle are well protected, and among mammals the armadillo, pangolin, and still more remarkably the extinct sloths of South America, are efficiently protected by bony plates more or less closely fitted together. Thus the position of the hard part is not distinctive of the two great groups into which animals are divided, but is a subordinate character in the definition of smaller assemblages.

ENDOSMOSE. See **OSMOSE**.

ENDYMION, according to some a huntsman, according to others a shepherd, and according to a third account a King of Elis. He is said to have asked of Zeus, whom many have called his father, eternal youth and eternal sleep. According to some, however, he was taken up into Olympus by Zeus, and becoming enamoured of Hera (Juno) was condemned to eternal sleep on that account. Others again relate that Selene (the moon), charmed with his beauty, conveyed him away to Mount Latmus in Caria, and threw him into a perpetual sleep in order that she might enjoy his kisses whenever she pleased. One story makes him the father of fifty daughters by Selene. The legend is the subject of Keats' principal poem. See **DIANA**.

ENERGY. The energy of a body is the power that it possesses of doing work, and it is measured by the work that it can perform. A body may possess energy in one of two forms, viz. as *kinetic energy*, that is the energy due to motion, and *potential energy*, that is energy due to what may be called a position of advantage. Thus a moving mass, a bullet for example, can do work in virtue of its motion, and the name kinetic energy (see also **VIS VIVA**) is given to energy of this kind. Under this name is also included energy belonging to molecular motion; that due to electricity in motion, to heat and light, and to actual chemical action. Again, as examples of potential energy, we may take the case of a mass raised up to a position in which it is capable of doing work by falling—the weight of a clock for instance,—or the case of a bent spring, the mainspring of a watch, which keeps the watch in motion while it is uncoiling. Under potential energy are included also the energy due to electrical separation, energy due to absorbed heat, energy due to chemical separation, as in gunpowder, which is ready to do work by means of its explosion. See also **KINETIC ENERGY**; **POTENTIAL ENERGY**; **WORK**; **HEAT**; &c. See also **PRINCIPLES OF THE CONSERVATION OF ENERGY**, under which name the doctrine of the Dissipation of Energy is briefly explained.

ENFANTIN, BARTHELEMY PROSPER, one of the chief apostles of St. Simonianism, and styled by its adherents le Père Enfantin. He was born 8th February, 1796, at Paris, where his father was a banker. In 1818 he entered the École Polytechnique, but as he assisted at the defence of Paris against the allies in the following year he was expelled. He then became clerk to a wholesale wine merchant, and was sent in the capacity of commercial traveller long journeys, which extended to the Netherlands, Germany, and even Russia. In 1821 he was employed as a banker at St. Petersburg, but returned in 1823 to Paris, where he afterwards obtained the post of director of the Caisse Hypothécaire. In 1825 he became acquainted with St. Simon, who was so charmed with his new disciple that when dying he confided to him the task of continuing the

work and of forming an association for the defence and promulgation of the new religion. Under the auspices of this association appeared a journal called the *Producteur*, which lived only for a year or so. About the year 1828 Enfantin had succeeded in drawing round him a considerable number of associates, some of whose names are not unknown in French literature; and public conferences were held, over which the government kept a suspicious eye. On the outbreak of the revolution of July, 1830, however, Enfantin had a free field, and issued his proclamation, in which he demanded a community of goods, the suppression of heritages, and the enfranchisement of women, which latter phrase meant with him community of wives. It was not long until the discordant elements inherent in such a society produced their due influence. Enfantin, the representative of the social and religious theories of the school, quarrelled with Bazard, the representative of its political ideas. The former organized model communities, which fell to pieces whenever they became subject to the experience of everyday life. Immense sums of money were advanced by enthusiastic believers, but were quickly swallowed up. The new organ of the sect, the *Globe*, was a failure; their convent at Mémilmontant, of which Enfantin was styled the supreme father, was broken up by government (1832). The father was sentenced to a year's imprisonment as an offender against public morality, but was liberated in a month or two. His next attempt was to found, in connection with a few faithful followers, a model colony in Egypt. At the end of two years ruin again stared them in the face, and on their return to France the disappointed *Père* retired to Tain (Drôme), where he lived for some time the peaceful life of a farmer. In 1841 the influence of some of his friends procured him employment as member of a scientific commission sent out to explore the industrial resources of Algiers. On his return he published a sensible and interesting work on the Colonization of Algiers (1848). The revolution of 1848 brought him again to the front, with his new journal, the *Crédit*. This venture stopped in 1850 for want of funds, and the influence of friends once more secured him a comfortable situation on the Lyons and Mediterranean Railway, which he held until his death in 1864.

ENFIELD, a market town of England, in the county of Middlesex, on the New River, 9 miles north by east of London, with a fine old parish church containing some interesting monuments, several other churches, various chapels, part of an old palace (of brick), and a handsome modern stone cross. The grammar-school dates from 1557. Enfield is the seat of the well-known government manufactory of rifles and small-arms. Pop. (1881), 19,119; (1891, boundaries altered), 31,532; (1901), 42,738. It gives name to a parl. div. of the county.

ENFIELD, WILLIAM, LL.D., a Dissenting divine of great learning and amiable character, was born at Sudbury in 1741. He was educated for the Dissenting ministry at Daventry, and in 1763 was chosen pastor to a congregation at Liverpool, where he published two volumes of Sermons, in 12mo, and a collection of Hymns and Family Prayers, which were well received. In 1770 he became resident tutor and lecturer on belles-lettres at the academy at Warrington, where he remained for several years, and published several works, including his well-known *Speaker*. Here he also drew up *Institutes of Natural Philosophy*, theoretical and experimental. After the dissolution of the academy he accepted an invitation to preside over a congregation at Norwich. In 1791 he published his *Abridgment of Bruckner's History of Philosophy* (two vols. 4to), a clear and able perform-

ance; and subsequently joined with Dr. Aikin and others in the *General Biography* (ten vols. 4to). He died in 1797.

ENFILADE (from the French *enfiler*), in the military art, is used in speaking of trenches or positions which may be scooped by the enemy's shot along the whole length. In conducting the approaches at a siege care must be taken that the trenches be not enfiladed from any work of the place. To avoid this they are generally cut in a zigzag.

ENGADINE, a beautiful valley in Switzerland, in the Grisons, on the banks of the Inn, bordering on the Tyrol, about 50 miles long, but in some parts very narrow, divided into Upper and Lower. The pop. of the whole valley amounts to about 12,000. The language generally spoken is the Ladin, a branch of the Romanic tongue. The majority of the young men leave the valley to push their fortunes, chiefly in North Germany and Russia, but return after they have amassed sufficient wealth to secure a quiet existence in their native place. Several pretty towns and villages are situated in the valley, which is visited by great numbers of strangers on account of its picturesque beauty and its mineral springs.

ENGEL, JOHANN JAKOB, a popular prose writer of Germany, was born at Parchim in 1741, and received the rudiments of his education from his father, the clergyman of that place. After studying at several German universities he accepted the office of professor in a gymnasium at Berlin, where he was soon made a member of the Royal Academy of Sciences, and wrote the greatest part of his works. He afterwards went to Schwerin. On the accession of King Frederick William III. of Prussia, whose tutor he had been, he was invited by his former pupil to Berlin, where he made himself exceedingly useful in the Academy of Sciences by his excellent and instructive writings, and enjoyed the esteem and the society of the most eminent men. His unremitting labours, in spite of sickness and hypochondria, hastened his end. He died at the place of his birth in 1802. Among his philosophical works may be mentioned his *Philosoph für die Welt*, distinguished for acute observations on men and manners, enlivened by elegant illustrations. Of a similar character is his *Mirror for Princes* (*Fürstenspiegel*). His *Ideen zu einer Mimik*, full of taste, acuteness, and knowledge of human nature, may be regarded as a kind of manual for players. He also wrote some plays—*Der dankbare Sohn*, *Edelknaben*, &c. His *Lorenz Stark*, a novel, is a masterly picture of life and manners. A complete edition of his works appeared at Berlin, 1801–1806, in twelve vols., and a later edition at Frankfurt in 1857, also in twelve vols.

ENGELHARDT, JOHANN GEORG VEIT, a German theologian, born at Neustadt, on the Aisch (Bavaria), in 1791. He studied at Baireuth and Erlangen under Bertholdt and Vogel. In 1822 he became professor of theology at Erlangen. On his return from a tour in Sweden, England, and France he was appointed ecclesiastical councillor, and during the years 1845, 1847, and 1848 was the representative of his university in the diet at Munich. He died in 1855. His most celebrated works are a translation of the writings ascribed to Dionysius the Areopagite; *Auslegung des speculativen Theils des Evangeliums Johannis durch einen Deutschen Mystischen Theologen* (1839); *Richard von St. Victor und Johannes Raynbrock* (1838); *Handbuch der Kirchengeschichte* (1834); and *Dogmengeschichte* (1839).

ENGHIEN, or ENGHEM, a town in Hainaut, Belgium, situated on the slope of a hill, on the road between Brussels and Tournai. Here is a superb castle with a park and gardens. This place gave the title of duke to a prince of the house of Bourbon Condé in memory of a victory of the great Condé

obtained here. The last that bore the title was executed, March, 1804. (See ENGLISH, DUKE OF.) Pop. (1897), 4539.

ENGLISH, LOUIS ANTOINE HENRI DE BOURBON, DUKE OF, was born at Chantilly, August 2, 1772, and was the son of Louis Henry Joseph Condé, duke of Bourbon. On the outbreak of the revolution he quitted France, travelled through various parts of Europe, and went in 1792 to Flanders to join the troops of his grandfather, the Prince of Condé, in the campaign against France. From 1796 to 1799 he commanded with distinguished merit the vanguard of Condé's army, which was disbanded at the Peace of Lunéville (1801). He was then led, by his love of the Princess Charlotte de Rohan Rochefort, to Ettenheim, in Baden, where he resided as a private citizen, and where he married this lady. He was generally looked upon as the leader of the *émigrés*, and was suspected by the Bonapartists of complicity in the attempt of Cadoudal to assassinate the first consul. A mysterious personage, who afterwards proved to be Pichegru, had been frequently seen to visit Cadoudal, and from the marks of respect shown him it was thought that it could be none other than the young duke. The spies of Napoleon reported that English was often absent for ten or twelve days together from Ettenheim, and it was believed that on some of these occasions he had secretly visited Paris. Napoleon was determined to strike terror into the ranks of the Royalists and conspirators by a decisive blow, and despatched General Ordener with 800 dragoons and several brigades of gendarmes to seize the duke and his companions, and Coulaingcourt was sent to the Duke of Baden with the first consul's explanations for this unwarrantable invasion of his territory. The Duke of English was seized at five o'clock in the morning of the 15th March, 1804, was conducted to Strasburg, and thence to the fortress of Vincennes, where he arrived on the evening of the 20th. That same night a court-martial, under the presidency of General Hullin, was assembled, and the prisoner was, after a mock trial, in which no witnesses were examined, found guilty on various charges of treason. He requested an interview with Bonaparte, which was refused, and he was immediately led out to execution. He was shot between four and five o'clock in the morning in the ditch outside the walls, and his body was thrown, dressed as it was, into a grave dug, it is said, the day before. Napoleon and the other chief actors in the tragedy took every pains to justify their conduct, or to throw the chief blame upon others' shoulders, and it is believed by some that the first consul found himself in the position of a leader whose subordinates are only too ready to rush to extreme measures on the least hint from their master.

ENGIA, the modern name of Ægina (which see).
ENGINEERING is, in its strict sense, the art of constructing or using engines, but the word is now applied in a more extended sense, not only to that art, but to that of executing such works as are the objects of civil and military architecture, in which engines or other mechanical appliances are extensively employed. It is divided into two branches, civil and military.

Civil engineering, as a profession, may be said to have originated in England about the year 1770, when the great improvements of the steam-engine by Watt opened up a new field for the talents of the engineer. Previous to that time, whenever the prospects of great advantage or profit induced individuals to incorporate themselves for the purpose of undertaking extensive systems of drainage, or for the supply of water, requiring the assistance of an engineer, recourse was generally had to the great masters of

hydraulic engineering, the Dutch. But the extension of the manufactures of this country, and the consequent extension of its home and foreign commerce, called forth all the energies of its men of practical science and skill, who at length, in the works performed for facilitating communication between different places, attained an eminence unsurpassed by any other nation. It is impossible here to give anything like a complete sketch of the duties of a civil engineer. He should have such a knowledge of mathematics as will enable him to investigate, as well as to apply the rules laid down by writers on those branches of the mixed sciences to which his attention will most frequently be drawn. He should be well acquainted with the principles of mechanics, hydraulics, and in a fair measure with all the branches of natural philosophy; a certain amount of chemical knowledge will be of considerable advantage. He should be able to draw neatly, and should understand the principles of projection upon which all engineering drawings are constructed; and a general knowledge of the principles of architecture will be found very valuable. Having acquired the requisite amount of theoretical information, he must next devote himself to gain that practical knowledge which is essential in order to the proper application of this information. The occupations of the civil engineer are so numerous, and the demand for talent in this walk of life so great, that the profession may be said to be divided into several distinct bodies: those who turn their attention to the construction of docks, bridges, canals, lighthouses, railroads, sewage and drainage, &c., which come more particularly within the scope of the duty of a *civil engineer*; those who devote themselves to the manufacture of machinery, or the *mechanical engineer*; the *mining engineer*, who discovers minerals and manages mines, &c.

The duties of the military engineer consist in the construction of fortifications, including the trenches and batteries required in besieging places; also of barracks, magazines, of roads and bridges to facilitate the passage of an army. He should have a practical and theoretical knowledge of gunnery. In this country he is often called upon to undertake works which more properly belong to the business of a civil engineer, such as the survey of the country, the inspection of public works, in fact all the duties of a government engineer. In 1818 the London Institution of Civil Engineers was founded, and the publication of its Transactions has been most useful in disseminating information relating to the objects of the profession. See also ENGINEER (STRANDBOAT).

ENGINEERS, ROYAL, that corps in the British army intrusted with the construction of all military works, plans, surveys, &c. Until 1783 the duties of engineers were discharged by officers taken from the army generally, but about this time a permanent corps was formed, and in 1772 the first company of sappers and miners was organized at Gibraltar. In 1783 the engineers were raised to be a royal corps, and in 1812 several companies of artificers were converted into sappers and miners. This title was abolished and that of royal engineers substituted in 1857. The corps, which now consists of about 8000 men, is divided into forty companies, four of which are at present employed on the ordnance survey, six are at Chatham, and the remainder on works at home and abroad. The privates, who are generally skilled artisans, receive a much higher rate of pay than the ordinary infantry soldiers, the pay of the highest non-commissioned officer in this branch of the service reaching six shillings per day. The discharge purchase is higher in this corps than in any other, yet it is found that the length of service does not average over five years, so many are the inducements held

out to them by civil employers. The officers enter the Royal Military Academy as cadets, and compete for commissions; their subsequent promotion is by seniority.

ENGINEERS, STEAMBOAT, the persons employed to keep the engine or engines of a steamer in as efficient a state as possible, and to superintend their working. It is the duty of an engineer to set the engines in motion, regulate their speed, or stop them, when required. While the engine is at work he must see that every moving part is properly lubricated; that no steam passes through valves or joints that should be steam-tight; that no air enters in any part of the engine where it is desirable to keep up a vacuum; and that none of the bolts, pins, or keys work loose by the vibration and shift their position. He must take care that none of the working parts become overheated by any undue amount of friction arising from want of lubrication, excess of tightness, or any other disturbing cause. He must carefully observe the effect produced by the gradual wear and tear of the working parts, so that if the accuracy of any of these seems to be materially affected, steps may be taken to remedy this when lying up in harbour. He must see that the engine is kept perfectly clean; must wipe away all grit and all superfluous oil and grease, as soon as they have passed through the bearings. The boiler will require his ceaseless attention in order that the proper supply of steam may be generated for the engine. The engineer must take care that a constant supply of water is kept up in the boiler; that the furnaces are periodically and properly fired and cleared of the earthy matters of the coal; that the boilers do not become impregnated with salt by the continual evaporation going on, and that the action of the valves continues to be correct. On arriving in port, after a long voyage, he should examine all the interior parts of the engine and get all defects rectified immediately. The water should be blown off out of the boilers and the ashes and soot cleaned out of the furnaces and flues as soon as possible. The slightest leak that can be discovered must be instantly stopped, otherwise the defect will spread rapidly. Any incrustation that may have been deposited from the brine must be thoroughly cleaned out from every part of the boiler. An engineer should be trained as a mechanic, and be a fair worker in iron, brass, and wood. He should know as much of mechanical drawing as to enable him, in the event of any important part of the engines being broken, to make such a drawing of it as would enable a manufacturer to replace it. He should be acquainted with the leading principles of mechanics, hydrostatics, and pneumatics, to which should be added an acquaintance with the subject of steam, especially as regards its temperature, pressure, and latent heat.—In the royal navy there are now several grades of engineers, the most numerous being those designated chief-engineer, engineer, and assistant-engineer respectively. All these are commissioned officers. Besides the above there is a numerous class of engineer artificers, whose duties are more or less mechanical, or resemble those of the ordinary engineer in the mercantile service. Those aspiring to be engineer officers generally enter as engineer students, the majority of whom gain this position by open competition. They then receive a certain course of practical training, partly at the expense of government.

ENGLAND, including **WALES**, the southern and larger portion of the island of Great Britain, is situated between 50° and 55° 46' N. lat., and 1° 46' E. and 5° 42' W. lon. On the E. it is bounded by Scotland; on all other sides it is washed by the sea; on the E. by the North Sea or German Ocean; on the S. by

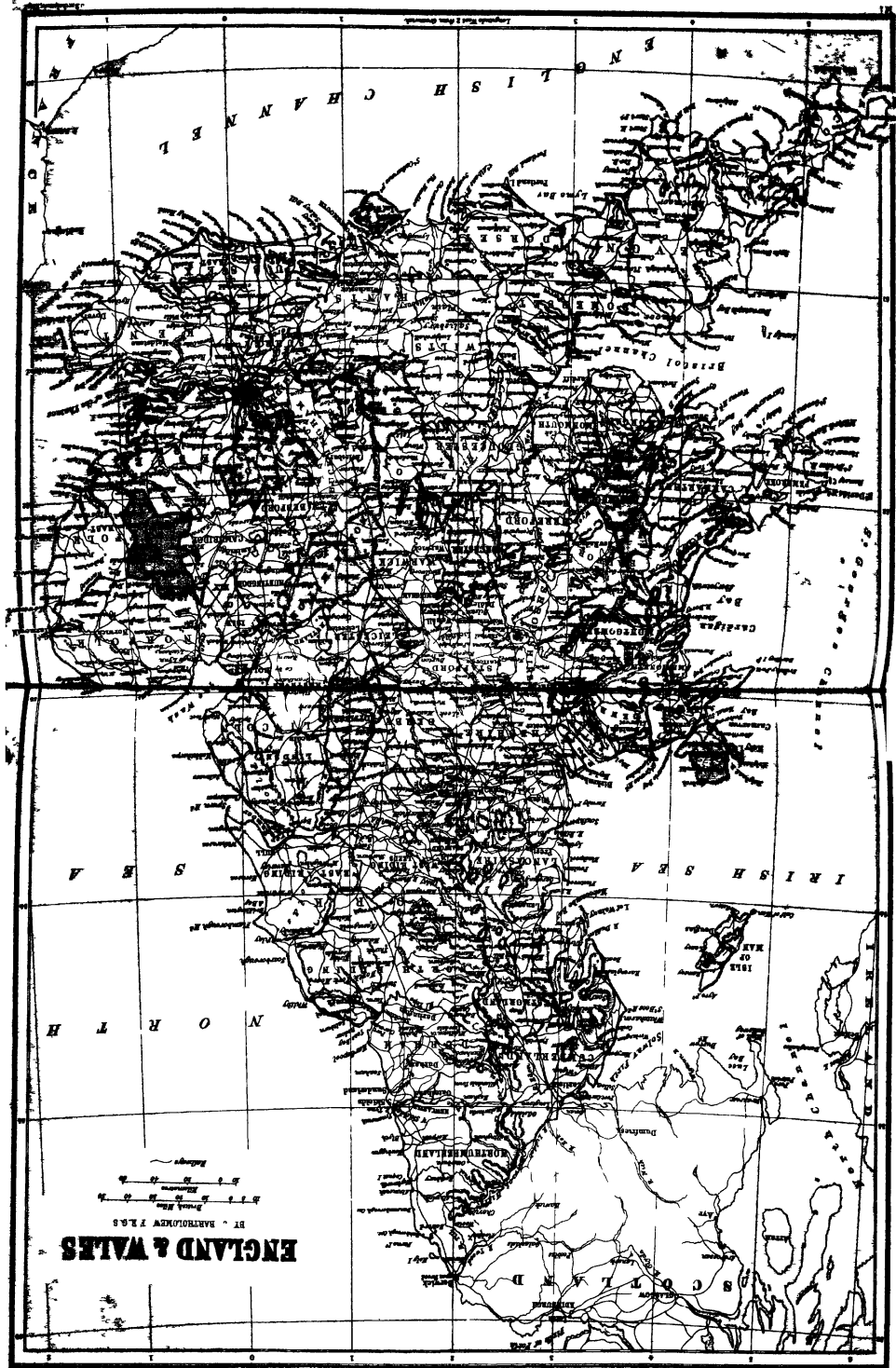
the English Channel; and on the W. by St. George's Channel and the Irish Sea. Its figure is triangular, the base of the triangle being formed by a line drawn from the South Foreland in Kent to Land's End in Cornwall; the eastern side by a line drawn from Berwick to the South Foreland; and the western side by another line commencing at Berwick and terminating at the Land's End. The dimensions of the triangle thus formed are. Base, 317 miles; eastern side, 345 miles; western side, 425 miles. North of the Humber, the average breadth does not amount to one-third of the average breadth south from that point. The area of England and Wales is 37,319,221 acres, or 58,811 square miles. See **BRITAIN**.

SKETCH OF THE CIVIL HISTORY OF ENGLAND.—The leading facts of the early history of England during the time of the Romans will be found in the article **BRITAIN**. After the withdrawal of the Roman forces, which took place about the beginning of the fifth century A.D., owing to the invasions of Italy by the surrounding nations, the South Britons, or inhabitants of what is now called England, were no longer able to withstand the attacks of their ferocious northern neighbours. The wall which the Romans had built from the Tyne to the Solway, no longer defended by Roman discipline and courage, proved a feeble barrier. The Scots and Picts from the north quickly passed it and drove the terrified Britons to the southern extremities of the island. In this situation they could devise no other means of defence than to invite the Romans to resume that superiority over them which they had formerly possessed. The Romans, unable to repel the invasions of the northern tribes from the vicinity of Rome itself, little regarded the petitions of their former subjects.

The Scots and Picts, satisfied with the plunder which they had obtained, returned homewards; but when the Britons, supposing that they were now to live in peace, ventured to leave their lurking-places, they were informed of the approach of another army, more numerous than that which had just ravaged their country. Less able to defend themselves than formerly, they thought only of courting the aid of some more powerful people. The Saxons, a nation inhabiting the northern parts of Germany, were at that time famous for their bravery and the boldness of their piratical expeditions. By gifts and promises the Britons hoped that they might induce the Saxons to undertake their defence, an experiment of which the consequences showed them the danger. The Saxons, inured to warlike expeditions, willingly accepted the invitation. Their own country was not the most fertile, and could scarcely support the number of inhabitants which it contained; they hoped that in Britain they might acquire new settlements, more fertile than those which they were to abandon; and they doubted not of their being able to defend them.

Notwithstanding the terror which had been impressed on the Britons by the Scots and Picts, the Saxons seem to have reckoned these tribes by no means formidable. According to the Anglo-Saxon narratives of these events, they despatched only three ships, containing 1600 men, under the command of Hengest and Horsa, brothers. Vortigern, at that time king of the Britons, received them with joy and assigned them the Isle of Thanet for a habitation. They immediately marched against the northern foe and justified the report of their valour by obtaining a complete victory. The date assigned to these events by the later Anglo-Saxon chronicles is 449 A.D.; but the true date of all that can be regarded as truly historical in what has just been recorded, is 450.

The Britons were soon convinced of the folly of their proceedings. They perceived that the Saxons,



whom they had invited for the purpose of protecting them, intended to make themselves masters of the country they had been invited to deliver, and were likely to become enemies more formidable than the Soots and Picts, from whose arms they had so earnestly sought to be rescued. The first handful of Germans that had come by invitation was followed by numerous uninvited bands, whose intention evidently was to settle permanently in the country and make it their own. The invaders are often spoken of as Saxons, but belonged to various tribes, of which the Angles and Saxons were most important. The first arrivals of all belonged to the tribe of the Jutes. The invaders gradually spread themselves over the country, the Jutes taking possession of part of Kent, the Isle of Wight, &c., the Saxons occupying a great part of the south of England, and the Angles the north and extending as far as the river Forth. The history of the conquest of England is very obscure. But whatever obscurity may be in the narrative of these transactions, it is sufficiently certain that, after a struggle which continued 150 years, the Anglo-Saxons remained entire masters of the country, and the southern part of Britain, with the exception of Wales, was divided into seven kingdoms, well known by the name of the Heptarchy, and governed only by Anglo-Saxon princes. As this division is of importance in the ancient geography of the country, it may not be improper to lay before the reader the mode in which South Britain was divided, with the dates usually given for the duration of the different kingdoms, though it must be remarked that we do not find seven independent kingdoms existing at any one time. Authorities in many cases do not agree as to the dates of foundation and termination of the several kingdoms, and as to other particulars regarding them; what seemed to be the most general view has in each case been adopted.

1. Kingdom of Kent, founded by Hengest in 455, containing Kent. This kingdom ended in 823.
2. Kingdom of South Saxons, founded by Ella in 477, containing Sussex, Surrey. Ended in 689.
3. Kingdom of East Angles, founded by Uffa 571 or 575, containing Norfolk, Suffolk, Cambridge, Ely (Isle of). Ended in 792.
4. Kingdom of West Saxons or Wessex, founded by Cerdic 519, containing Devon, Dorset, Somerset, Wilts, Hants, Berks, and part of Cornwall. Under Egbert swallowed up the rest in 827.
5. Kingdom of Northumbria, founded by Ida 547, containing York, Durham, Cumberland, Westmoreland, Northumberland, and the east of Scotland to the Firth of Forth. Absorbed by Wessex in 827.
6. Kingdom of East Saxons, founded by Erchev in 527, containing Essex, Middlesex, Hertford (part). Ended in 823.
7. Kingdom of Mercia, founded by Crida about 584, containing Gloucester, Hereford, Worcester, Warwick, Leicester, Rutland, Northampton, Lincoln, Huntingdon, Bedford, Buckingham, Oxford, Stafford, Derby, Salop, Nottingham, Chester, Hertford (part). Absorbed by Wessex in 827.

The history of the Anglo-Saxons, while the country continued to be divided into so many small and independent kingdoms, is not less confused than that of the period which immediately preceded it. Each prince was continually at war with his neighbours, and endeavouring to obtain for himself the entire sovereignty. Each state was, in its turn, annexed to some of the more powerful neighbours; and at length, in 827, Egbert, by the exertion of much valour, and the influence of a superior capacity, united in his own person the sovereignty of what had formerly been seven kingdoms; and gave the whole the name of England, a name which it has since retained. The state

of affairs in England after the accession of Egbert was not much better than it had been before. The ability of Egbert was sufficient to preserve the unity of the kingdom which he had acquired; but that kingdom was now attacked by foreign enemies, the Danes, who repeated their invasions at short intervals during the whole of the Saxon period. Under some of the successors of Egbert, who did not possess as much ability as he did, the states out of which the Kingdom of England had been formed did not cohere so well together; and although England was now nominally one, we sometimes hear of rival rulers in different parts of the country at periods long subsequent to the unification of the kingdom under Egbert. The circumstance naturally weakened the resistance offered to the Danish invaders, inasmuch as each of the states connived at the mischief done to the others, in the hope of recovering its own independence. About half a century after the erection of England into a single kingdom the Danes made themselves masters of nearly the whole of England, and compelled the English king to live in obscurity for a time, and leave the invaders undisturbed possessors of what they had wrested from him. Fortunately the king at this time, Alfred the Great, who ascended the throne in 871, was one who had patience enough to wait until he could again gather his forces together in sufficient strength to meet the Danes with a chance of success, and skill enough to make good use of the forces which he collected. A battle took place between the English and Danes at Ethandune, in which the latter were totally defeated (May, 878). Soon after, their leader Guthrum concluded a peace with Alfred, in which he agreed to embrace Christianity, and to retire with his followers to a strip of land on the east coast, including the whole of Northumbria, which was to be reserved for them, and called the Danelagh. Alfred reigned till 901, and during the latter part of his reign did much to improve the condition of his people.

Although generally recognizing the supremacy of the English kings, the Danish settlers had chieftains of their own whom they were always ready to support against their neighbours when a favourable opportunity offered itself. The two immediate successors of Alfred, Edward and Athelstan, respectively the son and the grandson of Alfred, both vigorous and able rulers, had each in turn to direct his arms against the settlers of the Danelagh. During the reign of Edward (901-925) these settlers received aid from the pirates of the same race who at that time began anew to roam over the seas and commit ravages wherever they could conveniently effect a landing. In spite of this, however, Edward was able to make good his authority throughout England. Athelstan (925-940) was equally successful. He crushed all enemies at home, and was respected abroad. The reigns of the next five kings, Edmund, Edred, Edwy, Edgar, and Edward the Martyr, are of less note. They are chiefly remarkable on account of the more or less conspicuous place which Dunstan, successively abbot, bishop, and archbishop, occupied during all of them. He was counsellor to King Edmund, minister of Edred, treasurer under Edwy and although he was banished by this last monarch his influence was great enough to excite a rebellion by which Edwy was deposed and Edgar his brother put in his place. During the reign of Edgar and his successor he was supreme. Throughout his whole career he naturally fostered the power of the church, but he manifested great ability as an administrator, and it was to a great extent due to him that from the time of Athelstan till after the death of Edward the Martyr (978 or 979) the country had comparative rest from the Danes. After the death of Edward Dunstan retired, and as the next king, Ethelred, was

a minor, the government was feebly conducted, and the Danes showed an evident intention of obtaining sovereignty of the whole of England. In this they were assisted by the renewed invasions of their countrymen. The degenerate English courtiers endeavoured, by giving the Danes money, to prevent their destructive ravages. The consequence was that might have been expected, they returned only the more suddenly. Animosities between the English and the Danes who had settled among them became daily more violent, and a general massacre of the latter took place on the 13th of November, 1002, which circumstance, instead of intimidating the Danes, and rendering their incursions less frequent, only stimulated them to more decisive attempts. Sweyn invaded the kingdom with a powerful army. Ethelred was compelled to take refuge in Normandy. Seizing a favourable opportunity, he afterwards returned, but found in Canute, afterwards called the Great, an adversary no less formidable than he had found in Sweyn.

Ethelred left his kingdom in 1016 to his son Edmund, who in the defence of his territories displayed uncommon valour; but the power and superiority of the Danes were now established too firmly to be shaken. Notwithstanding every exertion he was compelled to divide his kingdom with Canute, and when he was assassinated in 1017 the Danes succeeded to the sovereignty of the whole.

Canute (Knut), generally called the Great, espoused the widow of Ethelred, that he might thus reconcile to himself the minds of his new subjects. He obtained the name of Great, not only on account of his warlike, political, and civil qualifications, all of which seem to have been above the common rank, but from the extent of his dominions, being master of Denmark and Norway as well as England. After the conquest of England he passed the greater part of his life in peace. In 1035 he died, and in England was followed by other two Danish kings, Harold and Hardicanute, whose joint reigns lasted till 1042, after which the Saxon line was again restored in the person of Edward the Confessor. Edward died without heirs in 1066, and the crown was at once seized by Harold, the son of Godwin, and brother-in-law of the late king. Harold pretended that it was bequeathed to him by the late king. As his pretensions to the kingdom were founded only on his power, Harold did not enjoy it in quiet. He found many enemies, but none so formidable as the second cousin of Edward, William of Normandy, who likewise pretended that he, by the will of Edward, was appointed to succeed to the English throne. To support his pretensions William made the most vigorous preparations. To divert Harold's attention he instigated the Danes to invade the northern counties, while he, with no less than 60,000 men, landed in the south. Harold vanquished the Danes, and hastened southwards to repel the Normans. The two armies met near Hastings, at a place then called Senlac, but afterwards Battle. They were nearly equal in numbers, and fought with an obstinacy proportioned to the great object for which they contended. Harold and his two brothers fell, and the victory was William's. This great event took place Oct. 14, 1066. Having in reality conquered the kingdom, William immediately claimed the government; but as he knew that none was powerful enough to dispute his pretensions, he was willing to receive the crown as his right, and was desirous of being accounted the lawful king rather than the conqueror of England. For some time he conducted the government with great moderation; but being obliged to reward those who had assisted him in prosecuting his enterprise, he bestowed the chief offices of government upon Normans, and di-

vided among them a great part of the country. The English, offended at a mode of conduct which, though only what they had reason to expect, they accounted partial, reluctantly submitted to his sway, and seized almost every opportunity of making insurrections. Having reigned twenty-one years in England, and conducted the reins of government, in general, with success, he died in 1087.

William II., commonly known by the name of Rufus, though he was only the conqueror's second son, obtained the English crown on the death of his father, Robert, the eldest son, receiving the duchy of Normandy. Robert, indeed, claimed England too, but ultimately renounced this claim in favour of William, in consideration of the sum of 10,000 marks which the latter paid to enable him to join the Crusaders. In 1100 William was accidentally killed by an arrow while hunting in the New Forest, leaving behind him no legitimate children. The throne ought now to have reverted to Robert, his elder brother, but Henry I., his younger brother, by securing the treasury secured the inheritance. Anxious to obtain the affections of the people, that his imperfect title might be strengthened, he granted them a charter of rights, which in the time of John was made the foundation of the Great Charter. This would in some measure have compensated for his usurpation; but when Henry was confirmed in the throne he forgot his grant. Still farther to secure his crown he espoused Matilda, the great-granddaughter of Edmund Ironside, and thus the representative of the Anglo-Saxon line, being resolved to unite in his offspring the rights of the Saxons as well as of the Normans. Robert, whose disposition seems to have been somewhat indolent, arrived in England in 1101, and claimed the crown which justly belonged to him. But the actual possession of it gave Henry an insuperable advantage. His father's treasure was sufficient to balance the contest; and to render himself still more safe Henry courted the favour of the clergy. The primate Anselm effected a reconciliation before any blood had been shed in the quarrel. In 1106 Henry wrested from his brother even the duchy of Normandy, where the greatest misrule had been allowed to prevail, Robert having too little energy to keep his barons in check.

When Henry thought his power was sufficiently confirmed, he convinced the clergy that his friendship for them was not so sincere as he had found it necessary to pretend. He entered into a dispute with Anselm the primate, and with the pope, concerning the right of granting investiture to the clergy. He supported his quarrel with firmness, and at length, by compromising the matter, brought it to a more favourable issue than might have been expected. In 1135 Henry I. died in Normandy, leaving behind him only a daughter, Matilda.

By the will of Henry, his daughter Maud or Matilda, wife of the Earl of Anjou, and frequently styled the Empress Matilda, because she had first been married to Henry V., emperor of Germany, was declared his successor. But Stephen, son of the Count of Blois, and of Adela, daughter of William the Conqueror, raised an army in Normandy, landed in England, and declared himself king. After years of civil war and bloodshed Maud was obliged to make her escape from England, and leave the throne to Stephen. The contest was, however, taken up by her son, Henry Plantagenet, who raised an army with which he succeeded in landing in England; but before there had been any renewal of actual warfare, an amicable arrangement was brought about between Henry and Stephen, by which it was agreed that the latter should continue to reign during the remainder of his life, but that he should be succeeded

by Henry. Stephen died in 1154, and Henry Plantagenet ascended the throne with the title of Henry II. A larger dominion was united under the sway of this monarch than had been held by any of the previous sovereigns of England, for at the time when he became King of England he was already in the possession of Anjou, Normandy, and Aquitaine. The first two of these he had inherited in 1151 from his father, who was hereditary Count of Anjou, and who had succeeded in wresting from Stephen the dukedom of Normandy in 1144. The last he had acquired by his marriage with Eleanor of Aquitaine, the divorced wife of Louis VII. of France, in 1152.

The reign of Henry II. was, in general, fortunate. The king found little difficulty in restraining the licentious powers of his barons; but when he attempted to abridge the exorbitant privileges of his clergy, he experienced a more resolute opposition, and all his vigour was necessary to support him in the arduous contest. The clergy claimed exemption not only from the taxes of the state, but also from its penal enactments; and Becket, now raised to the primacy, supported them in their demands. The assassination of this priest (see BECKET) subjected Henry to the wrath of the church. He had undertaken an expedition against Ireland, at that time in a distracted state, and consequently an easy prey to an invader. To complete this expedition the pope's permission was necessary; and this permission could not be obtained till Henry made many submissions to the pontiff, and promised, when he returned, to walk in pilgrimage to Becket's tomb. Permission was at last granted. Henry easily conquered Ireland: when he returned he walked to Becket's tomb; and lay all night upon the pavement before it; submitted to be scourged by the hands of monks, and thus completed the triumphs of the clergy. The latter part of Henry's life was exposed to many disasters, arising chiefly from the rebellious disposition of his own family. He had appointed his son, Prince Henry, to be his successor; but that prince was impatient to obtain the crown before the death of his father. His projects, however, were disappointed; and in a short time he died without leaving behind him any children. In his foreign wars the king was successful. William, the king of Scotland, was defeated, taken prisoner, compelled to own himself Henry's vassal, and to do homage for his whole kingdom. It has been remarked, with justice, that Henry was the first who placed the common people of England in a situation which led to their having a share in the government. To curb the power of the nobles he granted charters to towns, freeing them from all subjection to any but himself. Henry, perhaps, thought only of curbing the exorbitant power of the barons, while he laid the foundation of a new order in society, which at length completely altered the government.

Richard, who in 1189 succeeded to his father, inherited all the superstition and romantic bravery of the age. The frenzy of crusading had then invaded the minds of Europeans, and the English monarch was impatient to distinguish himself in so conspicuous a scene. Disregarding the evils which must ensue to his dominions from his absence, he made every exertion to raise the money which was requisite, and in order that he might not leave a hostile neighbour on the north of his dominions, he renounced for himself and his successors the claim arising from King William of Scotland's act of homage done to Henry II. of the kings of England to be the feudal superiors of those of Scotland, he hurried into the East, and acquired the character of an intrepid soldier. Returning homewards in disguise, through Germany, he was basely made prisoner by Leopold, duke of Austria. The affection of his sub-

jects raised the sum necessary for his ransom; and he returned to his kingdom, which, during his absence, had been a scene of confusion. The two prelates to whom he had delegated his power had disagreed. John, his brother, had aspired to the crown, and hoped, by the assistance of the French, to exclude from his right the unfortunate Richard. Richard's presence for a time restored matters to some appearance of order; but the restlessness of his own disposition deprived him of all repose. He undertook an expedition against France; but at the siege of Chalons, in 1199, he received a wound by an arrow, which proved mortal.

That kingdom which John had so long sought to obtain by sinister methods, was at length his by succession; but he demonstrated how unworthy he was of the dignity to which he had so eagerly aspired. The reign of John was turbulent, disastrous to himself, but ultimately fortunate for his people. His follies, his crimes, and his ill-concerted attacks upon the power of his nobles, had alienated from him the affections of almost all his subjects. In this situation he undertook what had hitherto been found too difficult for the most prudent kings, supported by the undivided influence of the civil authority: he attempted to wrest from the ecclesiastics several of their privileges. The measures he adopted for this arduous undertaking were like his character, violent and imprudent. He forcibly ejected the monks from their convents, and even ventured in 1205 to oppose the pope in electing a successor to the see of Canterbury. The pope laid an interdict upon his kingdom, and excommunicated the king, absolving his subjects from their duties of allegiance. Had John been esteemed in England the fulminations of the pope would not have been formidable; but labouring under their universal hatred he was compelled to submit to the will of the pontiff, and was under the necessity of relinquishing his crown and again receiving it as a gift from the haughty bishop of Rome. Resenting the defection of his subjects in this unsuccessful dispute, John was eager to revenge upon them the indignities which he had undergone from the pontiff. He hoped that in this design the clergy, to whom he had yielded so far, would second him with all their influence. His subjects, on the other hand, had learned to entertain very despicable notions of their sovereign; they saw that he had neither prudence to form a good project nor fortitude to accomplish one which was bad. His nobles formed a resolution of compelling him to accede to such terms as might be necessary to secure their own privileges and to abridge the prerogatives of the crown. The clergy, instead of aiding him by their influence, entered warmly into the designs of the barons. John, after making a feeble and irresolute resistance, was obliged to yield to his nobles, as he formerly had done to the pope; and at Runnymede, yet revered for the important event, he signed the Great Charter (Magna Charta), which continues to be accounted the foundation of British liberty (June 15, 1215). During the next year John died. In his reign the dominions of England had been curtailed by the loss of the provinces of Normandy and Anjou, which John attempted to keep, but which Philip Augustus of France claimed for John's nephew, Prince Arthur, as French fiefs, and took possession of in 1204 and 1205. John was also deprived of part of Aquitaine, his possession in the south of France, being allowed to keep only that portion which now came to be called Gascony. The part now taken away was restored to Henry III.

The turbulent reign of John was succeeded by that of Henry III., almost equally turbulent. Henry was but ten years of age when he was crowned; and

during the first years of his reign the abilities of the Earl of Pembroke, who was declared regent, retained the kingdom in tranquillity; but when Henry at length assumed the reins of government he showed himself incapable of managing them. His great desire was to procure money from his subjects, not for the purpose of advancing national power and national prosperity, but to lavish on his pleasures, which were far from being the most refined. He often confirmed the charter which had been extorted from his father: he even added to it new privileges; but he as frequently broke through every part of it. The nobles, provoked by his breach of faith, had recourse to arms. Henry was compelled to grant everything required of him. A Parliament was summoned for the purpose of redressing grievances. They confirmed the charter of privileges for which the nation had so long contended; but having acquired the sovereign power, they were unwilling to give it up. It was agreed that a committee should carry on the national business during the intervals in which the Parliament did not meet. Simon de Montfort, earl of Leicester, engrossed the sole power. Prince Edward opposed the barons with an army, but was defeated, and taken prisoner. In 1258 Leicester called a new Parliament (the 'Mad Parliament'); and by summoning to it representatives of the people, he took into the legislature a body formerly unknown there, thus laying the foundation of the House of Commons, and consequently of British liberty. Prince Edward, finding means to escape from his guards, vanquished Leicester (who was slain in the battle) at Evesham in 1265, and restored his father Henry to that freedom and power of which he had long been deprived. But the efforts of Leicester were not without effect. The reforms he had introduced were respected at least in spirit, and the English people enjoyed a greater measure of liberty than hitherto. Henry died in 1272.

Edward received information of his father's death when returning from a Crusade, in which his love for military fame had engaged him. When he arrived in England he succeeded to the crown without opposition. He restored to the civil administration that regularity which, during the weak reign of his father and the civil wars which lately prevailed, had, in some degree, been forgotten. He even added to the laws a severity which had seldom before been experienced. He undertook, and in 1283 accomplished, the conquest of Wales; a country which, since that period, has given a title to the King of England's eldest son. When he attempted to reduce Scotland he was not equally successful. Though frequently vanquished in battle, and reduced to the greatest distress, the Scots were never subdued. Edward died at Carlisle in 1307 while leading a great army into Scotland, to complete the conquest of that country, on which he had set his heart. He was so much bent on uniting the whole island, including England, Scotland, and Wales, under his sway, that he paid little heed to his French possessions. He gave up the claim to Normandy, which the kings of England had never ceased to make since it was seized by Philip Augustus.

The whole of the reign of Edward II. was unfortunate to himself and calamitous to his kingdom. His father's last and most earnest request of him was to prosecute the war with Scotland, and never to desist till he had annexed that kingdom to his English dominions; but Edward's disposition and his capacity were both unlike those of his father. The war with Scotland was carried on, but the English were almost constantly unfortunate; and at length, at Bannockburn (June 24, 1314), they received a defeat from Robert Bruce, which insured the independence of Scot-

land, and prevented the English for many years from distressing that country by their almost continual invasions. Had the misfortunes of Edward consisted solely in the failure in his attempts at making foreign conquests, he might have been considered as comparatively happy; but his weak mind was incapable of regulating the lawless conduct of his barons: and his wife, a woman of a bold, intriguing, and somewhat libertine disposition, joined in the confederacy against him.

The regency of the queen was, in fact, the reign of her paramour Mortimer. Through a pretended moderation, indeed, he refused to accept a place in the privy-council; but while he governed the queen, his power in the kingdom was supreme. Edward III. soon showed a disposition entirely different from that of his father. In 1329 he took the reins of government into his own hands; and commenced his reign with a vigorous exertion of power. He seized Mortimer and the queen in the castle of Nottingham. The former was, with little examination, condemned to death; the latter was confined, during life, in the castle of Risinga.

The sceptre was no sooner secured in the hands of Edward than he displayed a warlike genius. His main projects were directed against France, the crown of which he claimed after the death of the last of the three sons of Philip the Fair, in 1328, in virtue of his mother, the daughter of Philip. This claim he made in spite of the fact that the Salic law in France did not admit of a woman occupying the French throne, Edward maintaining that although no woman could inherit the French throne, yet the right of succession might be transmitted by a woman. The war with France lasted for many years, and was carried on by the English with brilliant success. The victory won by the Black Prince at Crécy (1346), the capture of Calais (1347), and the victory of Poitiers (1356), ultimately led to the peace of Brétigny in 1360, by which Edward received all the west of France on condition of renouncing his claim to the French throne. (See BRÉTIGNY.) Before the close of his reign, however, these advantages were all lost again. England was deprived even of her hereditary possession Guienne, and retained only a few of the principal towns on the coast. Edward died in 1377.

Edward was succeeded by his grandson Richard II., the son of Edward the Black Prince. The people of England now began to show, though in a turbulent manner, that they had acquired just notions of government. In 1380, a poll-tax, of all taxes the most impolitic, and in this case rendered more than usually oppressive, by imposing the same sum on the rich and on the poor, excited the indignation of all, especially of the lower ranks, by whom it was most severely felt. A blacksmith in Kent, resenting an indignity offered to his daughter by one of the tax-gatherers, with a blow of his hammer laid him dead at his feet. This was the signal for insurrection: the people flocked together from every hand, and 100,000 men, under the smith, called Wat Tyler, marched towards London, claiming a redress of their grievances (1381). But after committing several outrages, the rebels were dispersed. Wat Tyler, while conferring with the king, was put to death; and the prudence and courage of Richard appeased the insurgents, who were preparing to avenge the death of their leader.

The conduct of Richard on this occasion, when he was only fifteen years of age, inspired hopes of a prosperous administration; but Richard was mild, perhaps effeminate, and deficient in that vigour which was necessary to curb the licentiousness of the nobles: though guilty of few outrages, therefore, towards his people, almost the whole of his reign was turbulent and unhappy. In a quarrel between

the Duke of Norfolk and the king's cousin, Henry Bolingbroke, duke of Hereford, son of the Duke of Lancaster, the fourth son of Edward III., Richard interfered, and banished the former for life, and the latter for ten years, a period afterwards limited to five. Both nobles obeyed the king's mandate; but during the absence of Bolingbroke his father died, and Richard unjustly appropriated the patrimony that ought to have fallen to Bolingbroke. To avenge the injustice Bolingbroke, now Duke of Lancaster, took advantage of the king's absence in Ireland to land in England and collect an army to act against Richard. So great was the number of the malcontents in England that he soon found himself at the head of 60,000 men, while Richard could only muster one-third of that number. Richard was thus obliged to surrender unconditionally. He was confined in the Tower, and solemnly deposed by Parliament, Henry being appointed king (1399), the first of the House of Lancaster. Richard was, in all probability, murdered early in 1400.

The manner in which the Duke of Lancaster, now Henry IV., acquired the crown, rendered his reign, as might be expected, extremely turbulent. The nobles, by whose aid he ascended the throne, thought that no reward equalled their services; while Henry justly dreaded that power, which, as it first raised him, could again at pleasure depress him. Such, however, was the vigour of his administration, and the promptitude of his measures, that every insurrection was quelled, and those who endeavoured to deprive him of power disappointed. During the reign of Henry IV. the clergy of England first endeavoured to confirm their power by burning such as differed from them in religious tenets, an act (*de hæretico comburendo*) having been passed in the second year of his reign, empowering them to do so. The act was chiefly directed against the Lollards, as the followers of Wycliffe, the translator of the Bible into English, now came to be called. Henry died in 1413, leaving his crown to his son, Henry V.

The earlier years of the prince who now ascended the throne had been distinguished chiefly by riot and dissipation; but he no sooner saw the sceptre in his power than he transferred his activity to pursuits more honourable to himself and more useful to his people. Taking advantage of the disorder in which the French nation was involved at this time, Henry, reviving the claim of Edward III. to the throne of France in 1415, invaded that country at the head of 30,000 men. The disjointed councils of the French rendered their country an easy prey; and the celebrated victory at Agincourt in 1415 dissipated the small portion of courage and unanimity which had formerly prevailed. A peace was concluded at Troyes in 1420, by which Henry received the hand of Katherine, the daughter of the French king, Charles VI., was appointed regent of France during the reign of his father-in-law (who was imbecile), and declared heir to the throne on his death. The two kings, Henry and Charles, died within a few weeks of each other in 1422, and the infant son of Henry thus became King of England and France at the age of nine months.

England, during the reign of Henry VI., was subjected, in the first place, to all the confusion incident to a long minority, and afterwards to all the misery of a civil war. Of a weakly body, and possessed of a mind still more weakly, Henry allowed himself to be managed by any one who had the courage to assume the conduct of his affairs. Margaret of Anjou, to whom he was married, was a woman of uncommon capacity; but she was by no means scrupulous as to the means by which her designs were accomplished. Even her intentions were not always

innocent; and she more frequently involved the kingdom in confusion, than used her influence for quelling such disturbances as were unavoidable. During this reign, in its turn disgraced by weakness of administration and the violent perversion of justice, the French began gradually to recover from that degraded state into which they had fallen during the reign of Henry V. The English forces were weakly supported, and the celebrated Maid of Orleans inspired her countrymen with new energies, and chased the terrified English from the French territories. The loss of France was not, perhaps, so great a misfortune as was at that time imagined; the civil commotions which immediately followed were much more destructive of national prosperity. Richard, duke of York, the father of Edward, afterwards Edward IV., in 1450 began to advance his pretensions to the throne, which had been so long usurped by the house of Lancaster. The pretensions of Richard to the throne were founded on his descent from the third son of Edward III., Lionel, duke of Clarence, who was his great-great-grandfather on the mother's side, while Henry was the great-grandson on the father's side of John of Gaunt, duke of Lancaster, the fourth son of Edward III. It may be mentioned that Richard of York was also grandson on the father's side of Edmund, fifth son of Edward III. The claims of the two rival competitors for the throne are completely stated in Shakespeare's King Henry VI. part II. act ii. scene 2, where they are summed up by the Earl of Warwick ('the King-maker') addressing Richard of York in the following words:—

'What plain proceedings are more plain than this?
Henry doth claim the crown from John of Gaunt,
The fourth son; York claims it from the third.
Till Lionel's issue fails his should not reign:
It falls not yet; but flourish in thee,
And in thy sons, fair slips of such a stock.'

The wars which resulted from the endeavours of Richard to make good his title to the crown of England are called the Wars of the Roses, from the fact that a red rose was the badge of the house of Lancaster, and a white one that of the house of York. It is impossible in such a brief sketch as this to recount all the vicissitudes of these bloody wars. Some of the details will be found in the articles relating to those who were most prominent during this epoch, and it is enough to say here that they are considered as lasting for thirty years (from the first battle of St. Albans, May 22, 1455, to the battle of Bosworth, Aug. 22, 1485); that during this time Henry VI. was twice driven from the throne (in 1461 and 1471) by Edward of York (whose father had previously been killed in battle in 1460); that Edward of York reigned as Edward IV. from 1461 till his death in 1483, with a brief interval in 1471; that he was succeeded by two other sovereigns of the house of York, first his son Edward V., who reigned for eleven weeks in 1483; and then by his brother Richard III., uncle of Edward V., who reigned from 1483 till 1485, when he was defeated and slain on Bosworth Field by Henry Tudor, of the house of Lancaster, who then became Henry VII. Henry VII. was at this time the representative of the house of Lancaster, through his descent from Henry Beaufort, cardinal of Winchester, one of the younger sons of John of Lancaster, his mother being the granddaughter of the cardinal. Through his father he was Earl of Richmond. Henry felt that his claim to the crown, except on the ground of victory, was not a strong one, and in order at once to strengthen his own title, and to put an end to the rivalry between the houses of York and Lancaster, he married in 1486 Eliza-

both, the sister of Edward V., and heiress of the house of York.

The turbulence which had prevailed in England during the civil wars did not suddenly subside; and though Henry's administration was vigilant and active, he was often disturbed by those attempts at insurrection which had become in some degree habitual to the nobles. In one point of view, indeed, his own conduct tended rather to augment than diminish the attempts at rebellion. His hatred to the house of York, notwithstanding his union to it in the person of his queen, was continually evident; and contributed to irritate those factions which the friends of their country had fondly hoped would have subsided. The impostures, first of Lambert Simnel, who pretended to be a son of the Duke of Clarence, brother of Edward IV.; afterwards of Perkin Warbeck, who affirmed that he was Richard Plantagenet, duke of York, younger brother of Edward V.; and the support which those impostors received from his subjects, convinced Henry that the house of York had still many friends: and the temper of the king led him rather to terrify them into obedience by his severity, than to reconcile them to his way by a mild demeanour. The numerous enemies of Henry's power, however, found him always prepared; and though the standard of rebellion was often reared, it never for a moment obtained a dangerous ascendancy in the kingdom. The king's knowledge, indeed, of the political art of reigning, equalled, if it did not excel, that of his most illustrious predecessors. He anxiously accumulated money, using every available means to extort it from his subjects. His principal instruments in his schemes of extortion were the infamous Empson and Dudley. Under pretext of undertaking an expedition against France he extorted money from his people; and obtained money from the French king for relinquishing a purpose which he never intended seriously to prosecute. Perceiving that the most imminent danger to the kings of England proceeded from the great influence of the nobles, he adopted such measures as gradually tended, without violence, to undermine their power. He permitted the nobles to sell their lands; and, under the severest penalties, forbade them to retain a great number of followers, who, under the name of servants, were ever ready to perform the most iniquitous orders of their masters. These measures, steadily pursued, necessarily, though silently, diminished the power of the nobles, and gave the death-blow to feudalism in England. After a reign prosperous to himself, and in general not unfriendly to the interests of his country, Henry died in 1509. (For an account of the leading events in Ireland during the reign of Henry VII. see IRELAND.)

The authority of the English crown, which had been so much extended by Henry VII., was by Henry VIII. exerted in such a manner as justly to entail on his memory the imputations of tyranny and caprice. During his time the power of Europe was divided between the illustrious rivals Francis I. of France and Charles V. of Germany. Henry's situation was such, that it belonged to him to hold the balance between them; and thus, in a very easy manner, he might have rendered himself, in one sense, superior to both. Instead, however, of guiding himself by the rules of policy, or even the dictates of a permanent friendship, he lent his aid to such as most successfully flattered his vanity. And though he did maintain between those monarchs a species of balance, by not affording his assistance permanently or exclusively to either, accident more than design gave rise to his conduct.

England owes to Henry VIII. the introduction of the Reformation; but this too was owing to his

caprice, and to the casual situation of his private affairs, more than to his conviction of the necessity of a reformation in religion, or the solidity of reasoning employed by the reformers. Henry had been espoused to Catharine of Spain, who was first married to his elder brother Arthur, a prince who died young. Henry became disgusted with his queen, whom, indeed, he never greatly loved. She was somewhat older than he; all his children by her died in their infancy except the Princess Mary; and the king was enamoured of one of the queen's maids of honour, Anne Boleyn. He had recourse, therefore, to the pope to dissolve a marriage which had at first been rendered legal only by a dispensation from the pontiff; and when the pope made delays, and ultimately denounced the course pursued by Henry, the latter broke away entirely from the Holy See, and in 1535 got himself recognized by act of Parliament as the head of the English Church.

Had not the extravagance of Henry equalled his other vices, he might have amassed immense wealth. When he quarrelled with the pope he was careful to dissolve all the religious houses, monasteries, and convents, and he immediately seized their revenues. It is not easy to perceive to what extravagancies his own impetuosity and the servile complaisance of his Parliament might have hurried him: his conduct was becoming daily more capricious and tyrannical, when he died in 1547. He was married six times, and left three children, each of whom reigned in turn. These were: Mary, by his first wife, Catharine of Aragon; Elizabeth, by his second wife, Anne Boleyn; and Edward, by his third wife, Jane Seymour. Edward reigned first, with the title of Edward VI. He was but nine years of age at the time of his succession. His father, by his will, had declared that Edward was to assume into his own hands the reins of government when he should be eighteen years of age; but he lived not to reach that period: he died when he was only sixteen. His short reign, or rather the reign of the Earl of Hertford, afterwards Duke of Somerset, who was appointed regent, was distinguished chiefly by the success which attended the measures of the reformers. The Protestants attained great part of the power which had formerly been engrossed by the Catholics; and in their turn showed themselves extremely willing to put in practice all the arts of persecution. Edward died in 1553.

The intrigues of Dudley, duke of Northumberland, during the reign of Edward, procured Lady Jane Grey, who was married to the duke's son, Lord Guildford Dudley, to be declared his successor; and after that prince's death she was, almost without her knowledge, proclaimed queen, and forced, very much against her inclination, to ascend the throne. The pretext on which she was put forward as a claimant for the crown was that she was the granddaughter of Mary, the second daughter of Henry VII.; and the prior claims of the three princesses, Mary and Elizabeth, daughters of Henry VIII., and Mary, queen of Scots, granddaughter of Margaret, eldest daughter of Henry VII., were set aside by her supporters, in the case of the first two by the allegation of their illegitimacy, and in the case of the last, on the ground that she was a foreign princess. Her reign, if it could be called such, lasted only a few days. Mary, daughter of Henry VIII., was placed upon the throne. Lady Jane Grey and her husband were both confined to the Tower; and, notwithstanding that their pretended criminal conduct was altogether involuntary, they were afterwards executed.

Mary, a sincere Catholic, seems to have wished for the crown mainly for the purpose of re-establishing the Roman faith; and her purposes were faithfully

seconded by Bonner, a Catholic no less zealous than herself. Political motives had induced Philip of Spain to accept of Mary as a spouse; but, notwithstanding her affection for him, she could never prevail on her subjects to allow him any share of power. He, for that reason, openly despised her; and, indeed, seldom saw her, or visited England. Vexation on this account, as well as on account of the loss of Calais, the last possession in France now remaining to England, in 1558, added to other maladies, hastened Mary's end. She died in November in the same year in which Calais was taken.

Elizabeth succeeded to her sister Mary. Herself attached to the Protestant faith, she was resolved to establish it in England, and found little difficulty in the undertaking, owing to the strength which the Reformation movement had attained.

Having concluded a peace with France, Elizabeth had leisure to take part in the affairs of Scotland, which at that time were involved in confusion. The plan of the English queen was to continue and foment, rather than terminate, this confusion. She artfully effected her purpose, by encouraging and supporting, in their turns, the heads of the different factions. She thus secured herself from the designs of a troublesome neighbour, and prevented any intention which the French might entertain of invading her from the Scottish frontier. Her activity in Scottish affairs was augmented by her rivalry with Mary, the queen of Scotland, and the secret hatred which she cherished towards her. When that princess's crimes, according to some, or her misfortunes, according to others, induced her to take shelter in England, Elizabeth, instead of using her with kindness, or protecting her from insult, made her a prisoner; refused to see her; retained her many years in confinement; encouraged her subjects in the accusation of their sovereign; and at last, by an iniquitous sentence, condemned her to lose her life. Whether Mary's conduct were criminal or unfortunate, Elizabeth's proceedings cannot be palliated. They fix on her memory a stain which time cannot obliterate.

England was the most powerful nation which had adopted the Protestant faith; and on that account Elizabeth was hated by all the Catholic sovereigns. Philip of Spain, actuated by that bigotry which so strongly marked his character, and incited by policy, as well as by personal animosity, resolved to attack Elizabeth in her own dominions, and to annihilate the heretical kingdom. With this view, he, in 1588, fitted out a fleet more powerful than any which Europe had yet seen; and manned it with his most experienced sailors, and his bravest soldiers, styling it the 'Invincible Armada.' It was placed under the command of Alfonso Perez, duke of Medina Sidonia. It arrived on the English coast; but instead of finding an easy prey, was fiercely attacked by Elizabeth's fleet, under Lord Howard of Effingham, which, though not of equal strength, was more manageable. The English vessels were under the command of officers of approved valour and skill: by seizing every favourable opportunity they gained many advantages over the Spaniards, and at length convinced them that their hopes of conquest had been somewhat too sanguine. Directed with little knowledge, and ill provided for a long voyage, the Spaniards were soon in want of every necessary. A storm which at this time overtook them completed that destruction which the English fleet had commenced. The Spanish fleet sailed homewards by the northern part of the island; many of them were wrecked on the coasts of Scotland; and of the whole invincible armada few ships returned safe to Spain.

Worn out with the cares of state, and oppressed

by griefs of a more private kind, Elizabeth, after a reign of forty-five years, at length sunk under the combined pressure. The execution of the Earl of Essex, who had been her chief favourite, but who abused her goodness, more than any other cause, seemed to unhinge her soul. She expired in 1603, and was succeeded by James VI. of Scotland, who was descended from Henry VII. by his eldest daughter Margaret, who had been given in marriage to James V. (For an account of the policy which Elizabeth pursued in Ireland, see IRELAND.)

The character of Elizabeth, as well as of other distinguished monarchs of England, will be found more fully dwelt upon in the several articles under their respective names, than in the present slight historical sketch. The reader, therefore, is referred to these for fuller information. The history of England after the union of the crowns, as well as many details connected with the statistics of the country, will be found under the article BRITAIN.

SKETCH OF THE ECCLESIASTICAL HISTORY OF ENGLAND.—The first religion of the Celtic aborigines of England was Druidism. See DRUIDS.

It is impossible for us to fix, with precision, the commencement of Christianity in Britain. It has been conjectured that the light of the gospel may have reached Britain, by the way of France (then called Transalpine Gaul), before the conclusion of the first, or not long after the commencement of the second century. As no churches are recorded to have existed in France before the second century, we may warrantably infer that none existed in Britain till some time after they were established in France. Tertullian, who lived during the latter part of the second and the first part of the third century, is the most ancient authority who attests the existence and prevalence of Christianity in Britain. He does so in one of his apologies; but his authority, unless corroborated by other evidences, must be received with caution; for an apparent proneness to exaggeration is visible in the work in which the statement is made. But of this we are certain, that it made considerable progress in our island previous to the time of Constantine the Great (306–337). There can be no reasonable doubt, that when Christianity was established by Constantine within the ample range of the Roman Empire, it would make more ample progress in this country than before that event. But we know very little about it till the rise of the Pelagian heresy, at the commencement of the fifth century. Pelagius, that noted heresiarch, was a native of Wales, whose real name is supposed to have been Morgan; and his coadjutor in spreading the heresy which bears his name was Celestius, an Irishman. Their peculiar opinions made considerable progress among the British Christians, as might reasonably have been expected, but were at length extinguished by the efforts of Germanus and his disciples. Several bishops from Britain sat in the famous Council of Nice, A.D. 325, as also at the Council of Sardica, 347; and of Ariminum, in Italy, in 359; and in A.D. 519 an ecclesiastical synod of all the British clergy was held by St. David, archbishop of Caerleon, and uncle of the famous King Arthur, for extirpating the remains, and preventing the revival, of the Pelagian heresy.

But, however flourishing and prosperous the state of Christianity might have been in the times of Roman subjugation, it was doomed to suffer a total eclipse, nay, an almost utter extinction, by the arrival of the pagan Saxons. (For their religion, see NORTHERN MYTHOLOGY.) It was not till A.D. 570 that the first rays of evangelical light dawned upon the Saxon conquerors of Britain, by means of a marriage alliance between one of their petty monarchs and the daughter of a king of France, a princess warmly

attached to Christianity. In A.D. 596 the famous Austin, or St. Augustine, was sent over by Pope Gregory the Great to attempt their conversion. He, with forty other monks, landed in England, and was kindly received by Ethelbert, who assigned Canterbury as the place of residence to Austin and his companions. They entered it in solemn procession, carrying the picture of Christ before them, and a silver cross, singing a hymn. Their pious endeavours were crowned with such success, that in a very short time the king and most of his subjects were converted; and no fewer than 10,000 of them were baptized on Christmas day. Upon the news of Austin's success at the Papal court, more missionaries were sent to Austin, and a model for the government of the infant church, and a valuable library of books, vestments, sacred utensils, and holy relics. Austin's efforts, however, to reduce the Welsh Christians to dependence on the Papal authority failed of success; and, in revenge, the ghostly abbot threatened them with the wrath of Heaven and the hostilities of the English.

The East Saxons were soon after converted by Mellitus, and a bishop's see was established at London, their capital, early in the seventh century. The Northumbrians were next converted, which auspicious event was accelerated by the marriage of their king, Edwin, with Ethelburga, a daughter of Ethelbert, king of Kent. That princess having the free exercise of her religion secured to her and her household, was accompanied by Paulinus, a missionary, into her new dominions, whose labours were so successful, that Edwin and his high-priest Coifi, a great many of the nobility, and great multitudes of the common people, renounced paganism and were baptized; no fewer than 12,000 are said to have received the initiatory rite of baptism in one day. By the influence of Edwin and Paulinus, Carpwald, king of the East Angles, and many of his subjects, were converted; and as a reward for the services of Paulinus, Edwin erected a bishop's see at York, and even obtained an archbishop's pall for him from Pope Honorius I., who sent one at the same time also to Canterbury. The conversion of the other kingdoms of the heptarchy followed in the course of the seventh century.

As Kent and Wessex received Christianity from Romish and French missionaries, and Mercia and Northumbria through the Scottish Culdees (for Northumbria had apostatized after the death of its first Christian king, and received Christianity anew from a Scottish source), there were certain differences between the churches, especially concerning the time of keeping Easter. To promote the union of the churches thus founded in England with the Church of Rome, a grand council was summoned by Theodore of Tarsus, archbishop of Canterbury, to meet at Hertford, A.D. 673, at which he presided; and obtained their consent to a number of canons which he had brought from Rome, demanding a perfect uniformity among all the English churches. Besides this union among the English churches, and conformity to the Romish Church, which was brought about by Theodore, several new doctrines and practices were introduced that were formerly unknown; amongst these was the introduction of an articulus or secret confession to a priest, as necessary to absolution, directly contrary to the doctrines of the Scottish missionaries, who taught that confession to God was sufficient. Theodore, by his address, now obtained the recognition of Canterbury as the metropolitan see, exercising authority over all the English clergy.

The clergy, by their successive encroachments upon the liberties of the people and the rights of the sovereign, attained, particularly after the era of the Norman conquest, to such a height of spiritual and temporal domination as to form an *imperium in im-*

perio. Gregory VII., who filled the Papal throne from 1073 to 1085, was the most audacious and ambitious, the most able and arrogant pontiff that ever sat in the chair of St. Peter. Having wrested the right of supremacy and investiture from every Christian prince, he imposed the following oath of allegiance, upon every bishop at his inauguration, to the temporal and spiritual authority of himself and successors: viz. 'The rights, privileges, and authority of the holy Roman Church, and of our lord the pope, and his successors, I will be careful to defend, enlarge, and promote; all heretics, schismatics, and rebels against our said lord and his successors I will, to the utmost of my power, persecute and impugn.' From this time the bishops became the spies and sentinels of Rome; and in order to insulate their affections, to detach them from the state to which they belonged, and to engage them thoroughly in the interest of the holy see, celibacy was strictly enjoined. William the Conqueror, to whom a circular letter was sent by Gregory demanding an annual tribute, boldly resisted this claim, and asserted his right as an independent sovereign, denying that his kingdom was a fief of the holy see, but agreed to pay the tax of Peter's-pence. This was a tax of a penny on each house, said to have been first granted by Ina, king of Wessex, about A.D. 720, for the establishment of an English college at Rome. In process of time it became a standing and general tax over all England; and though at first it was applied to the support of the English college at Rome, the popes found means to appropriate it to themselves. It was confirmed by the laws of Canute, Edward the Confessor, William of Normandy, &c., and was not totally abolished till the reign of Henry VIII.

In the reign of Henry II. the power of the clergy had arrived to a stupendous height, as is clearly shown by the whole history of the quarrel of that monarch with his leading prelate, Thomas Becket, an account of which is given in the article BECKET (THOMAS). As is well known, this quarrel resulted in the murder of Becket by four of Henry's barons (Dec. 29, 1170), but the severity of the penance exacted from Henry on this account is a striking proof of the power that the church then had in punishing all offences committed against itself.

In order to atone for his offence, and to procure full reconciliation with the church, he had to bind himself to give to the knights templars as much money as would pay two hundred knights for one year to serve in the Holy Land; and at next Christmas to take the cross, and go in person into the Holy Land the following summer, unless he obtained a dispensation from the pope; to allow to the pope supreme jurisdiction in all matters relating to the clergy; and to do penance at the tomb of Becket, which Henry, after his arrival from France, performed in the following manner: 'Leaving Southampton, he took the road to Canterbury; and was no sooner in sight of that city, than, alighting from his horse, though yet at a league's distance, and pulling off his boots, he walked barefooted, in extreme pain, the road being purposely strewed with sharp gravel stones, to the holy tomb; where, after he had taken a little rest, he submitted to be scourged on the bare back with forty stripes by the prior and the monks of St. Augustine; after which he passed the night in prayer, lying on the pavement of the church; and next morning, after having attended a procession round the holy tomb, he set out for London.'

In the long interval between the Norman conquest and the era of the Reformation, a period of nearly 500 years, very few ecclesiastics occur worthy the attention of the historian, as any way remarkable for genius or learning. Thomas Bradwardine, arch-

bishop of Canterbury, was one. This learned and pious person was born about the middle of the reign of Edward I.; he studied at Oxford, and was one of the proctors of that university, in A.D. 1325. He was the greatest mathematician and theologian of his day. He was confessor to Edward III., and attended him in his French wars; he was chosen Archbishop of Canterbury by the monks, but Edward refused to part with him; however, soon after, being chosen a second time, Edward consented to the election. He did not long survive his consecration, but died seven days after his arrival at Lambeth Palace. It is only from his great work, entitled, *The Cause of God against the Pelagians*, that we are able to form a proper estimate of the piety, the deep humility, the metaphysical acumen, and argumentative genius of the man. John Wycliffe, rector of Lutterworth, was another eminent precursor of the Reformation; and contributed, by his life and writings, to pave the way for that great event, by the translation of the Scriptures into English. While divinity professor at Oxford he published certain conclusions against transubstantiation, the pope's infallibility; denied that the Church of Rome was the head of the other churches, that St. Peter had the power of the keys any more than any other of the apostles, and affirmed that the New Testament or gospel is a perfect rule of life and manners, and ought to be read to the people; that there were only two orders of spiritual rulers, viz. bishops and deacons; that all human traditions are superfluous and sinful; that religious ceremonies are unlawful, and that men ought not to be restricted to a prescribed form of prayer. All these opinions of Wycliffe were condemned at Rome, as might be expected, and positive orders were sent to England to stop the progress of Wycliffism. But the reformer, supported by the powerful protection of John, duke of Lancaster, though his books were burned, and himself deprived of his professorship, got leave to end his days in peace, at his rectory of Lutterworth. He wrote about two hundred volumes, all of which were called in, condemned, and ordered to be burned, together with his bones, by the Council of Constance, in 1415, nearly forty-one years after his death. But his doctrine remained; and his disciples, called Lollards, a nickname, as Mosheim observes, generally affixed to pious persons in these times, by their adversaries, as Pietist, Puritan, and Methodist in after times, increased after his death; although several sanguinary laws were passed against them by several successive Parliaments, and many, at different intervals, were committed to the flames.

ANCIENT ENGLISH INSTITUTIONS, CONDITION OF THE PEOPLE, &c.—For an account of the Anglo-Saxon institutions, and the condition of the people of England during the Anglo-Saxon period, see the article **ANGLO-SAXONS**.

Institutions under the Norman Kings.—The Norman conquest, by the introduction of the continental feudal system into England, caused a complete change in the mode of tenure of land, and led also to great alterations in the constitution of the army, the administration of justice, and the position of the king and church. The Domesday-book, compiled by order of William the Conqueror, is the great source of information referring to the internal administration of the country under the Normans. From this we learn that William divided the whole territory of the kingdom into 60,215 fiefs, the half of which were granted to civil superiors, while the other half were reserved for the crown and the church. These estates, along with right of possession in all the buildings erected upon them, all the revenues to be derived from them, and with a population corresponding to the size of the estate, either totally

enslaved or only partially free, pledged to the payment of certain sums for protection, or in the way of taxes, and to the performance of certain services for their masters, were granted under the condition that they should return to the crown or the liege lord of the feudal tenant on the death of the latter without any heirs enjoying the right of feudal succession (escheat), or in case he were guilty of felony (forfeiture). The possessors of these fiefs were required to equip and support a number of heavy-armed horsemen proportionate to the size of the estate. About 1400 of the largest fiefs were granted to crown vassals, under the condition that, on being summoned by the king, they should themselves, with all their feudal dependents, gather round the king's banner, or if they happened to be churchmen (bishops or abbots) they should merely send their dependants. As the possessions of the crown vassals were often very large, and these 'great barons,' as they were called, were consequently bound to equip considerable bodies of heavy-armed soldiers, it became a common practice both among secular and ecclesiastical tenants to subdivide their fiefs into smaller ones, and let these off to other tenants on similar conditions to those under which their own estates were held. These vassals of the great barons were required to take an oath of allegiance not only to their immediate feudal superior, but also to the king as the superior of the whole land; and thus all the three grades of vassals, the great barons, the small barons, and the vassals of the great barons, were bound together by the common obligation of military service to the crown. This last grade consisted chiefly of proprietors of middle rank, who formed the gentry or inferior thanes among the Anglo-Saxons. The greater thanes had been mostly expelled from their holdings by the Norman invaders. In addition to these three classes the Domesday-book also makes mention of other two classes liable to military service, the freemen (*liberi*) and the sokemans, the former of whom at the time of compilation amounted to about 12,000 and the latter to 23,072. The 'freemen' were probably for the most part composed of representatives of the old 'ceorls,' or free peasant proprietors, who at one time formed the main strength of the Anglo-Saxon population. Although called free they cannot be regarded as having been really such, and still less entitled to that name were the sokemans. Upon both classes it was imperative that they should perform certain services to the lords of the land in which their possessions lay; only their estates were capable of being inherited by their sons of full age. The remainder of the *ceorls* had sunk to the condition of bondmen, whom the Normans designated by the contemptuous appellation of 'villeins.' They were a poor oppressed class, and can scarcely be considered as having been better situated than the slaves, who are also mentioned in the Domesday-book. Such was the feudal system as it was introduced into England by William the Conqueror, and as it continued to exist for about four centuries, until it almost fell to pieces during the wars of the Roses, and was finally extinguished in the reigns of Richard III., who passed a law to protect the rights of the buyer of an estate against the claims of the heirs of the seller, and of Henry VII., who passed another law with the same purpose, besides one prohibiting the nobles from keeping armed retainers.

The administration of the law and the constitution of the various courts of law in England did not suffer so great changes as were made in the mode of tenure of land and the structure of the army in consequence of the Norman supremacy in England. In accordance with an oath which William had taken

to maintain the good and approved laws of Edward the Confessor, he appointed men having a knowledge of the law to determine such laws and customs as had been in use in the time of the Saxon kings, and commanded that the law should be administered according to the same forms and principles as before the conquest. The tribunals of the hundreds, which during the most flourishing period of the Saxon rule had been held every month, and took cognizance of the smaller offences committed within the limit of their jurisdiction, had already, before the close of the Saxon period, lost a great deal of their importance, and thus it was natural that with the gradual disappearance of the free peasantry and the extension of the feudal relations to all ranks of society, the jurisdiction formerly held by the hundreds should pass to the lords of the manors. On the other hand the county courts, or *scir-gemote*, which met twice every year under the presidency of the ealdormen and *scir-gerefas* (sheriffs) to decide disputes that arose in each county, were still preserved during the Norman period. A royal court was now erected, which was to be supreme, and decide all disputes about crown fiefs. This supreme court rapidly grew in importance, as complaints were frequently made of the arbitrariness and partiality of the judges in the county courts, and appeals to the supreme court became common. The ancient Germanic institutions of compurgators, trials by ordeal, wergeld, and frank pledge (or pledge of peace, as the term originally was), according to which the tithings into which the hundreds were divided were jointly responsible for each of their members, were still retained under the Normans. The chief innovations made under the Normans in the administration of the law were the institution of travelling courts and the civil jury. The former was an institution by which each sheriff was required to pass at least twice every year through all the hundreds in his county, and as the royal representative pronounce sentence on minor offenders. The institution of the civil jury enabled the parties in a suit about a disputed possession or succession, instead of appealing to trial by combat, to have their claims settled by a commission of lawyers. The municipal rights of towns and cities grew out of their separation from the jurisdiction of the ealdormen and sheriffs. Of the more important towns which bore the title of cities (*civitates*), in contradistinction to the towns and boroughs, the king reserved the greater number to himself after the completion of the work of conquest. Only a few were handed over to the separate crown vassals. The following are mentioned in the Domesday-book as fortified places: Canterbury, Nottingham, York, Oxford, Hereford, Leicester, Stafford, Chester, Lincoln, and Colchester. The inhabitants of towns were required to pay a sum of money into the royal treasury, to pay duties on all merchandise entering or leaving the towns, and to furnish aid in money to the king in all emergencies. In return they received from the king various privileges, and as they increased in times of peace in number and prosperity they gradually acquired the right of self-government under royal officers. The towns were the nuclei in which a new class of society arose out of the old freemen, sokemans, and villeins.

For an account of the state of the church under the Normans see the previous sketch of church history.

Slavery.—Mention has been made in the preceding account of English institutions under the Normans, of the existence of slavery in England. Slavery was practised in England both before and after the coming of the Anglo-Saxons, as well as under the Normans, and slaves formed a very valu-

able article of exportation from England to all parts of the Continent. It was the sight of a number of English slaves in the market at Rome that inspired Gregory the Great with the resolution of attempting the conversion of their countrymen to the Christian faith. The mildest fate that prisoners could expect in the long-continued wars of the British and Saxons between the several kingdoms of the heptarchy, and between the English and Danes, was to be sold as slaves. The Jews were the principal slave merchants, and found a good market for their slaves among the Saracens in Spain and Africa. The exportation of slaves continued to the Norman Conquest, and the city of Bristol was a noted emporium of this ignominious and cruel traffic. The influence of Christianity, however, was gradually effective in putting a stop to the practice of holding slaves. Several laws and canons of the church were made in England against selling Christian slaves to Jews or pagans; and it was a common practice for the priests to exhort those who were near death to release their slaves if they had any, in order to secure their salvation. Thus it happened that the whole population in course of time enjoyed their liberty, without the necessity of any active endeavours on the part of the enslaved portion of the population to liberate themselves.

Learning and Education.—That Roman learning had made some way at least in some of the chief centres of Britain before the arrival of the Anglo-Saxons, may be inferred from the fact that Pelagius, the great heresiarch of the fourth century, and St. Patrick, the great Christian missionary of the end of the fourth and the beginning of the fifth century, are both said to have been Britons. Of the state of learning during the time of the Saxons but little is known, and that little does not relate to any continuous period. The seventh and eighth centuries were the brightest in this respect in Saxon England, and during this period England furnished the Continent with some of the most learned teachers of the time. Even then, however, this learning was confined to the clergy. In the following century the ravages of the Danes began, and in the troublous times that followed learning became extinguished. So much was this the case, that Alfred the Great, when a young man, could find no instructors in any of the higher branches of learning; and at the time of his accession to the throne there was hardly a person to the south of the Humber who understood the common prayers of the church, or who was capable of translating a single sentence of Latin into English. During the first part of Alfred's reign (871-878) he was too much occupied in attempting to free his country from the Danes to be able to devote any attention to enlightening the darkness of the time; but after he had restored peace to his dominions by his victory over Guthrum in the latter year, he began to study the Latin language himself, and to encourage learning among his clergy. He invited to his court the most learned men to be found in any part of the country, and even brought teachers from foreign countries. It is not unlikely that he re-established many of the old monastic schools, and his biographer Asser states that he founded a seminary for the sons of the nobility, and that he set apart an eighth part of his whole revenue for its endowment. Some have maintained, although apparently on insufficient grounds, that out of this seminary grew the University of Oxford. The schools founded by Alfred were probably maintained under his successors during the tenth century; but at the close of that century, when the ravages of the Danes began again in the reign of Ethelred, it is probable that all learning again disappeared; and it may with

equal probability be inferred that when the country again obtained peace under Canute schools began once more to flourish. The subjects generally taught in the schools of those times appear to have been grammar, the Greek and Latin languages, astronomy, and theology. Although, as has been stated, it is not improbable that schools may have been in existence during the period of Danish rule and in the reign of Edward the Confessor, the state of learning at the time of the Conquest appears to have been very low even among the clergy, so as to furnish William the Conqueror with a plausible pretext for depriving many of the ecclesiastics of England of their benefices, and supplying their places with more learned men brought from the Continent. The efforts of William were directed towards raising the standard of learning in England by showing favour to the church, founding monasteries, and giving an example to his subjects by taking care that his own son Henry Beauclerc should be well educated. Lanfranc, an Italian, whom William appointed to the see of Canterbury, and Anselm, who succeeded Lanfranc in 1093, were both zealous in the cause of education. Schools were established in connection with all the cathedrals and monasteries in the kingdom; and influenced by the example of the Normans, the English among whom they were settled began to display a considerable degree of intellectual activity, the result of which was that in the course of the two centuries that followed a considerable body of Latin literature was produced in England, partly by Anglo-Normans, but to a great extent also by native English. The schools here referred to as established in connection with the religious houses throughout the kingdom, were almost exclusively intended for those who wished to make the church their profession, and it was not thought necessary to make any provision for educating the laity in the higher branches of learning. Learning, indeed, was customarily looked upon as almost the exclusive right of the clergy; and they themselves cherished the same feeling, and treated the unlearned laity with the greatest contempt. The wants of the laity were not, however, left entirely unprovided for. In addition to the schools connected with the religious houses others were erected for their benefit, but they were merely intended to provide instruction in the elementary branches of education. It ought to be mentioned that the instruction given in the schools in England for some time after the Conquest was conveyed in the Norman French language. The reason for this was that the great majority of the schoolmasters were clergymen, and accordingly belonged to the number of those Normans that had been invested with most of the ecclesiastical benefices. Pinkerton fixes upon the time of Edward III., the period of overt hostility between France and England, as the time when the French language began to be generally disused in England.

The two great universities, Oxford and Cambridge, that have ever since been the chief seats of learning in England, did not, in all probability, exist in any form in which the name of universities was applicable to them, until the twelfth century, although there can be no doubt that schools of some note had existed at both these places long before that date. As the instruction in the common schools was given in the French language, the language used at the universities was Latin both for lectures by the professors and for exercises and disputations among the students.

CHURCH OF ENGLAND.—The established religion in England is Episcopacy. The sovereign is the supreme head; by this authority he convokes and

prorogues the convocations of the clergy. The church is governed by two archbishops and thirty-five bishops. The Archbishop of Canterbury is styled the *primate of all England*, and to him belongs the privilege of crowning the kings and queens of England. The province of Canterbury comprehends twenty-five bishoprics. In that of the Archbishop of York, who is called the *primate of England*, there are ten bishoprics (including Sodor and Man). Archbishops and bishops are appointed by the king, by what is called a *congé d'élire*, or leave to elect, which is sent to the dean and chapter naming the person to be chosen. The archbishops and bishops (but only to the number of twenty-four) have seats in the House of Lords, and are styled the *spiritual lords*. The archbishops have the title of *grace*, and *most reverend father in God by divine providence*; bishops are addressed by the title of *lord*, and *right reverend father in God by divine permission*. The former are said to be *enthroned*, the latter *installed*. To every cathedral belong several prebendaries and a dean, who form the dean and chapter or council of the bishop. The next order of the clergy is that of archdeacons; subordinate to the bishop, their office is to reform abuses and to induct into benefices. The most numerous and laborious order of the clergy are the deacons, curates, vicars, and rectors. The office of the deacon is confined to baptism, reading in the church, and assisting the priest at the communion. A parson is one who has full possession of all the rights of a parish church; if the great tithes are *impropriated* the priest is called a *vicar*; if not, a *rector*; a *curate* is one who is not instituted to the cure of souls, but exercises the spiritual office in a parish under a rector or vicar. The doctrines of the Church of England are contained in the thirty-nine articles: the form of worship is directed by a liturgy.

The first steps to the establishment of the English Church were slow. In 1531 the convocation of the clergy addressed a petition to King Henry VIII. as the chief protector and only and supreme lord of the English Church. Not very long after, the Parliament abolished appeals to the see of Rome, dispensations, licenses, bulls of institution for bishoprics and archbishoprics, the payment of Peter's-pence, and the annates. In 1534 the convocation of the clergy and the two universities declared that the bishop of Rome had no more jurisdiction in England than any other foreign bishop. In the same year the Papal authority was set aside by act of Parliament, and by another act of Parliament, passed in 1535, Henry assumed the title of supreme head of the Church of England. But these acts, although they severed the connection between the English Church and the holy see, did not alter the religious faith of the church. Henry VIII. desired to make scarcely any change in the dogmas or rites of the church, and put to death those who were not content to accept the modified catholicism which he formulated in the six articles (promulgated in 1539), and wished to make still further innovations on the ancient faith than he himself did, as well as those faithful Catholics who continued to recognize the supremacy of the pope. The articles of faith of the new church were declared to consist in the Scriptures and the three creeds, the Apostolic, the Nicene, and the Athanasian (see CREED); the real presence, the use of images, the invocation of saints, &c., were still maintained. Under Edward, the duke of Somerset, the protector of the realm during the minority of the king, caused a more thorough reform of the doctrines and ceremonies of the church to be made. At his instigation Parliament repealed the statute of the six articles (1547), and in 1551 a new confession of faith was embodied in forty-two articles, denying the infallibility of councils, keeping only two sacra-

ments, baptism and the Lord's supper, and rejecting the real presence, the invocation of saints, prayer for the dead, purgatory, and the celibacy of the clergy. At the same time a new liturgy was composed, in which English was substituted for Latin. With the reign of Mary the old religion was re-established; and it was not till that of Elizabeth that the Church of England was finally instituted in its present form. The doctrines of the church were again modified, and the forty-two articles were reduced to thirty-nine by the convocation of the clergy in 1563. As no change was made in the episcopal form of government, and some rites and ceremonies were retained which many of the reformed considered as superstitious, this circumstance gave rise to many future dissensions. The controversy concerning the ceremonial part of divine worship commenced with those exiles who, in 1554, fled from the persecutions of Queen Mary, and took refuge in Germany. On the accession of Elizabeth they returned, and renewed the contest at home which had begun abroad. These were called *Puritans*, and at one time comprised many distinguished members of the English clergy. (See *PURITANS*.) During the reign of Elizabeth they met with no toleration. In 1559, before the close of the first year of her reign, two acts were passed with the object of bringing about the entire subjection of the church and the people in religious matters to the royal authority. These were the Act of Supremacy and the Act of Uniformity. The former required all beneficed ecclesiastics, and all laymen holding office under the crown, to take the oath of supremacy, renouncing the jurisdiction, whether spiritual or temporal, of every foreign prince or prelate; the latter made it incumbent on every clergyman, whether beneficed or not, to use no other than the established liturgy, and imposed a fine on all who absented themselves from church on Sundays and holidays. On the accession of James the Puritans hoped for some relief; but an Episcopal hierarchy was more favourable to his views than the Presbyterian form of government, and he publicly adopted the maxim 'No bishop, no king.' When the English divines returned from the Synod of Dort (1618-19) the king and the majority of the Episcopal clergy discovered an inclination to the sentiments of Arminius which have since prevailed over Calvinism among the English clergy. Under Charles I. the attempts made, through the instrumentality of Laud, to reduce all the churches of Great Britain under the jurisdiction of bishops, and the suppression of the opinions and institutions that were peculiar to Calvinism, cost the Archbishop of Canterbury his head, and had no little effect in embittering the civil contest between the throne and the Parliament. After the death of Laud the Parliament abolished the Episcopal government, and condemned everything in the ecclesiastical Establishment that was contrary to the doctrine, worship, and discipline of the Church of Geneva. As soon as Charles II. was restored to the throne the ancient forms of ecclesiastical government and public worship were restored; and three important acts were passed in his reign tending to exalt the authority of the church. The first of these was the Corporation Act of 1661, requiring, among other things, that none should be elected to a magistracy, or to any office of trust in a corporation, who had not taken the sacrament within one year before their election, according to the rites of the Established Church. The second was the Act of Uniformity, passed in 1662, requiring every beneficed clergyman, and even every fellow of a college, and schoolmaster, to declare his full assent to everything contained in the Book of Common Prayer, and excluding all who refused to observe the rites and subscribe the doctrines of the

Church of England from its communion. The third was the Test Act, passed in 1673, which enacted that every person appointed to hold a temporal office of trust should take an oath against transubstantiation. In the reign of William III., and particularly in 1689, the divisions among the friends of Episcopacy gave rise to the two parties called the *high-churchmen*, or *non-jurors*, and *low-churchmen*. The former maintained the doctrine of passive obedience, or non-resistance to the sovereign under any circumstance whatever; that the hereditary succession to the throne is of divine institution, and cannot be interrupted; that the church is subject to the jurisdiction of God alone; and, consequently, that certain bishops, deposed by King William, remained, notwithstanding, true bishops; and that those who had been appointed in their places were rebels and schismatics, and all who held communion with them were guilty of rebellion and schism. The gradual progress of civil and religious liberty, during the last 150 years, has settled practically many such controversies. The great increase of the Dissenters in recent times (they are not much less numerous than the members of the Established Church) has led to new concessions in their favour; and especially to the repeal of the corporation and test acts (by Act 9 Geo. IV. cap. xvii. 1828); the Catholic emancipation (in 1829); and the opening of the universities in England to Dissenters (1871).

The thirty-nine articles, as the established confession of the English Church, deserve a short analysis. The five first articles contain a profession of faith in the Trinity; the incarnation of Jesus Christ, his descent to hell, and his resurrection; the divinity of the Holy Ghost. The three following relate to the canon of the Scripture. The eighth article declares a belief in the Apostles', Nicene, and Athanasian creeds. The ninth and following articles contain the doctrine of original sin, of justification by faith alone, of predestination, &c. The nineteenth, twentieth, and twenty-first declare the church to be the assembly of the faithful; that it can decide nothing except by the Scriptures. The twenty-second rejects the doctrine of purgatory, indulgences, the adoration of images, and the invocation of saints. The twenty-third decides that only those lawfully called shall preach or administer the sacraments. The twenty-fourth requires the liturgy to be in English. The twenty-fifth and twenty-sixth declare the sacraments effectual signs of grace (though administered by evil men), by which God excites and confirms our faith. They are two: baptism and the Lord's supper. Baptism, according to the twenty-seventh article, is a sign of regeneration, the seal of our adoption, by which faith is confirmed and grace increased. In the Lord's supper, according to article twenty-eighth, the bread is the communion of the body of Christ, the wine the communion of his blood, but only through faith (article twenty-ninth); and the communion must be administered in both kinds (article thirty). The twenty-eighth article condemns the doctrine of transubstantiation, and the elevation and adoration of the host; the thirty-first rejects the sacrifice of the mass as blasphemous; the thirty-second permits the marriage of the clergy; the thirty-third maintains the efficacy of excommunication. The remaining articles relate to the supremacy of the king, the condemnation of Anabaptists, &c.

ENGLISH ART. Architecture.—Numerous so-called Druidical stones, a few rude towers, and some other mysterious structures, are the only remains of the architecture of the ancient Britons. The only monuments of the Roman occupation of the country are the ruins of military works, such as roads and

fortified walls that had been executed on a magnificent scale. Very little can be said with regard to the style that prevailed in England between the invasion of the Anglo-Saxons and the Norman conquest, from the fact that the remains of buildings erected in England before the Conquest are few and insignificant. There was not a single cathedral built before that date but was rebuilt during the Norman period, or at some later time, and although there are traces in numerous churches of pure Saxon architecture, there is no entire church now standing which was built during the Saxon period. There is thus little known about this style beyond the fact that it was a variety of Gothic, probably rather rude. The Normans introduced a more highly developed kind of Gothic, the style in which most of the English cathedrals are built. The earlier specimens of this style of architecture in England, such as may be seen in parts of the cathedrals of Rochester, Winchester, and Canterbury, naturally exhibit no distinctively English features, but resemble on all points the works executed in the same style on the Continent. It was not till the beginning of the twelfth century that the new architecture began to assume a character of its own peculiar to England. Durham Cathedral affords the best illustration of this style. The ogive or pointed arch appears to have been introduced into English architecture in the second half of the twelfth century, and the first traces of its use are to be found in the cathedrals of Canterbury, Rochester, and Northampton. This new modification of Gothic architecture soon made way for itself, although it appears to have been adopted with some reluctance in England. In the end it became the prevailing and even the sole style of ecclesiastical architecture in England, the round arch being entirely disused for three centuries. Among the edifices erected in this style between the twelfth and fifteenth centuries may be mentioned the cathedrals of York, Wells, Winchester, Lichfield, Worcester, Chichester, Lincoln, Westminster, &c. The most characteristic peculiarity of Gothic architecture in England, after the introduction of the pointed arch, consists in the form of the windows in which the mullions rise right up to the main arch of the window, and are often crossed by horizontal bars. This peculiarity has caused the name of perpendicular to be given to the style of architecture in which it is found. The Tower of London, Windsor Palace, and the great hall of the palace of Edward III., are the finest specimens of military and civil architecture belonging to the same period as the religious edifices above-mentioned. The Renaissance style of architecture made its appearance under the Tudors, and was associated with the Gothic. The palaces of Richmond and Hampton Court, the chapel of Henry VIII., and the tombs of Queen Mary and Queen Elizabeth at Westminster, Bishop West's chapel in the cathedral of Ely, and the six coffins placed by Bishop Fox round the choir of the cathedral of Winchester, are the principal examples of this mixed style, in which are wanting both the elegance in details and the capricious fancy which distinguish the productions of continental art during the same epoch. In the reign of Charles I. Inigo Jones designed, among other buildings, St. Paul's at Covent Garden and Greenwich Hospital in a peculiar style, imitating the Græco-Roman. Architecture, neglected under the Commonwealth, revived after the Restoration, when Sir Christopher Wren designed an immense number of buildings, particularly St. Paul's Cathedral at London, the towers of Westminster, the Sheldonian theatre of Oxford, Chelsea Hospital, &c. Other architects of his time were not less productive. Among them are Gibbs* and Sir John

* Scottish.

Vanbrugh. In the eighteenth century the style of Louis XV. prevailed in England. The most celebrated architects of the time were W. Chambers and Robert Taylor. At the present day English architects are in the habit of copying indifferently from all styles, and sometimes even mix up different styles in the most monstrous fashion. The most striking novelty in architecture in the nineteenth century is the method of building in glass and iron, first resorted to on an extensive scale by Sir Joseph Paxton in the International Exhibition of 1851, and subsequently adopted in the Crystal Palace and various other structures. See ARCHITECTURE.

Painting and Engraving.—Very little is known of the state of the art of painting among the Anglo-Saxons. In the seventh century, Biscop, abbot of Wearmouth, brought from Italy a large number of pictures with which he adorned the churches dependent upon his monastery. In the ninth century Alfred the Great, with the view of refining his warlike subjects, caused numerous manuscripts to be made and adorned with miniatures. Towards the end of the tenth century, Dunstan, archbishop of Canterbury, had the reputation of being an expert miniature painter, and some of his illuminations are preserved in the Bodleian Library at Oxford. Under the reign of William the Conqueror, and those of his two sons, the painting of large pictures began to be studied. Lanfranc, archbishop of Canterbury, a native of Lombardy, one of the most renowned men of letters of his time, adorned the vault of his church with paintings of ravishing beauty, to use the expression of a chronicle of the period. Numerous miniatures of the thirteenth and fourteenth centuries have come down to us; the execution is rude, but the style does not want originality. From this period down to the eighteenth century there were few native painters, and scarcely any of any importance in England. A succession of foreign painters were attracted to the country by the munificence of some of the English sovereigns, and of the English aristocracy, but no native talent was developed in this direction. Among these foreign painters connected with England may be mentioned Hans Holbein, a German painter, who enjoyed the favour of Henry VIII.; Federigo Zuccaro, an Italian, who came to England in the reign of Queen Elizabeth, and painted at her court; and Sir Antony Vandyck, the great Flemish portrait-painter, who lived at the court of Charles I. There is one native English painter deserving of mention who appeared before the close of the seventeenth century, although even his chief works belong to the eighteenth. This was Sir James Thornhill (1676-1734), the painter of the cupola of St. Paul's in London, and of the Painted Hall in Greenwich Hospital. The period of the decline of the art on the Continent was the time when England attained her highest eminence in it. When there was no longer any art in Italy, Spain, Germany, Flanders, and Holland, and when France alone of continental countries possessed some painters of lively fancy, there suddenly appeared in London a painter of original and consummate genius, who may almost be said to have created a new kind of painting, in which the artist exhibited the qualities of a moralist and satirist combined with those of the painter; and he was closely followed by two portrait-painters, whose portraits rivalled, in point of elegance, those of Vandyck. The first of these was William Hogarth (1697-1764); the two latter, Sir Joshua Reynolds (1728-92) and Thomas Gainsborough (1727-88). Gainsborough was a distinguished landscape as well as a portrait painter. Throughout the eighteenth century portrait-painting was the most brilliant specialty of the English school. At the same time that Reynolds

and Gainsborough flourished there lived also George Romney (1734-1802), who almost equalled them in excellence, and a little later Sir Henry Raeburn* (1756-1823), a painter endowed with some share of the vigour of Velasquez, and Sir Thomas Lawrence (1769-1830), who attained more nearly than any other painter to the elegance of style of Sir Joshua Reynolds. He succeeded Sir Joshua in 1792 as court-painter. The names of Barry,† Opie, and Copley may also be mentioned among those who manifested more talent in the painting of simple portraits, than in the historical composition which they attempted.

There also flourished during this century Richard Wilson (1713 or 1714-82), a Welsh landscape-painter in the style of Claude and Poussin, and Benjamin West (1738-1820), an historical painter, who, though American by birth, deserves to be mentioned here from the fact of his having come early to England, and having been connected with England during the most of his life. He merits remembrance not only on account of his distinction as a painter, but also on account of what he did towards diffusing a taste for the fine arts among the English public by helping to organize exhibitions of paintings.

Hogarth had no immediate successor in the painting of familiar scenes of daily life. This kind of painting was revived with great effect at the beginning of the nineteenth century by Sir David Wilkie* (1785-1841), one of the most popular and highly esteemed of British artists. He made his first appearance at the Academy Exhibition of 1806 with his *Village Politicians*, and since that date the class of paintings in which he excelled has been the favourite one with most English painters, and that in which they have attained the greatest eminence. Among the painters who have followed in the footsteps of Wilkie may be mentioned William Mulready† (1786-1863), Charles Robert Leslie (1794-1859), Daniel Maclise† (1811-70), John Phillip* (1817-67), William Powell Frith (born 1819), Thomas Faed* (1826-1900), William Holman Hunt (born 1827), and Sir John Everett Millais (1829-96). The two last were among the founders of the pre-Raphaelite school of painters, the distinguishing characteristic of which is extreme fidelity in matters of detail. The chief historical painters of the nineteenth century include William Etty (1787-1849) and Benjamin Robert Haydon (1786-1846); by far the most celebrated landscape painter is Joseph Mallord William Turner (1775-1851); and Sir Edwin Landseer (1803-73) is the most distinguished animal-painter that Great Britain ever produced. Water-colour painters have been very numerous and successful in England; among them are Corbould, Gattermole, Haghe, Wehnert, Prout, Gilbert (also an oil-painter), &c. See PAINTING.

Until the eighteenth century engraving was not cultivated at all in England except by foreign artists. The German engraver, Wenzel Hollar (died 1677), was the most distinguished engraver in England in the seventeenth century. Alongside of the national school of painters, created in the eighteenth century by Hogarth, Gainsborough, and Reynolds, there arose almost simultaneously an English school of engravers. Hogarth himself acquired some distinction in the art of engraving; but those who were more specially devoted to this branch of art were George Vertue (1684-1756, celebrated especially for portraits), Sir Robert Strange* (1721-92), Valentine Green (1739-1813), and Richard Earlom, (1743-1822). The last two were mezzotint engravers, and carried this branch of the art to a high degree of excellence. The most celebrated line-engravers in the period immediately

subsequent to that during which those just mentioned lived were William Sharp (1749-1824), James and Charles Heath (the former died 1834, the latter 1848), and James Fittler (1756-1835). At this period many small plates were produced as illustrations for books. Towards the end of the eighteenth century the stipple style of engraving was introduced by the Italian Bartolozzi, and since that period it has been followed by a good many English engravers. In 1775 Thomas Bewick (1753-1828) revived engraving on wood, a style which has since been very extensively resorted to for the illustration of periodical and other works. The most distinguished of his followers were his pupil Clennell, Branston, and John Thompson. Among other English engravers on copper or steel we may enumerate George Doo, John Burnet,* Samuel Cousins, William Holl, Edward Goodall, and John H. Robinson. (See ENGRAVING.) In steel-engraving English artists have manifested a decided superiority over those of other countries. In lithography, too, some of the English artists have displayed genuine talent. Among the best works which have appeared in this department may be mentioned the collections of architectural views of England and Belgium by Haghe and Nash.

Sculpture.—Cæsar records that the ancient Britons were fond of cutting out ornaments of various kinds on their chariots of war, but that they were entirely ignorant of the art of casting statues in metal, or cutting them in stone. The ivory drinking-horn of Ulfus preserved at York is one of the few specimens of carving that has come down to us from the time of the Anglo-Saxons. After the Norman Conquest the arts of carving and sculpturing were practised almost wholly by foreign artists, Frenchmen and Italians, and it was not till the thirteenth century that some remarkable works began to be produced by native artists. At this epoch, however, the arts of carving and sculpture were still regarded merely as hand-maids to architecture. These arts received a check during the wars of the Roses, and were not again cultivated till the Renaissance period, when Torregiano came from Italy and executed two masterpieces in England, the tomb of the mother of Henry VII., and that of Henry himself, at Westminster. The troubles of the reign of Charles I. and the Commonwealth produced a new stagnation in the art; and what is more to be regretted, were the cause of the destruction of many valuable works of art in this department. After the Restoration two sculptors of some note appeared in England, Grinling Gibbons, a wood-carver, born at Rotterdam, and Caius Gabriel Cibber, who, though ridiculed by Pope, was a man of real talent. During the eighteenth century there was no English sculptor of eminence till John Flaxman (1755-1826) appeared to resist the false taste of the time. His monument to Lord Mansfield, and his statues to Pitt and Reynolds, are among the finest productions of English sculpture. He had for rival and successor Sir Francis Chantrey (1781-1841), who acquired renown by the statues which he made of most of the eminent men of his time. John Carew, Lawrence Macdonald,* Sir Richard Westmacott (1775-1856), Edward Hodges Baily (1788-1867), and John Gibson (1790-1866), are a few of the sculptors of the earlier half of the nineteenth century, to whom we should not forget to add J. H. Foley, W. C. Marshall, P. MacDowell, Sir John Steell, and H. Weekes as among the first sculptors of their time. Sculptors of the English school in general are characterized by a sort of romantic grace which is their distinguishing mark, and by extraordinary delicacy and finish in detail; but they exhibit weakness in the modelling of naked parts. See SCULPTURE.

* Scottish.

† Irish.

* Scottish.

LANGUAGE AND LITERATURE.—1. Language. The English language is a direct development of the Anglo-Saxon, a circumstance which makes it questionable whether the latter speech ought to be distinguished by a separate name. But although a direct development of the Anglo-Saxon, it is not a development which has been allowed to take place regularly and gradually, as the result merely of internal causes. One important external influence was brought to bear on the original form of our language, which had the double effect, first, of producing a much more sudden and complete modification of the grammatical structure than could have taken place if the language had grown up independently of foreign influences; and secondly, of giving a composite character to the vocabulary of the language by the introduction of a large number of foreign words. This external influence was the Norman Conquest, in consequence of which a new language, the Norman-French, came to be spoken in England by those who had made themselves the masters of the country, and who formed, therefore, almost the only class that had leisure and opportunity for literary pursuits. The immediate result of the Norman Conquest (1066) was thus that the language of the Normans came to be the chief literary language of England (except where Latin was used), and that the Anglo-Saxon was reduced to a very subordinate place. When the latter language again comes into notice as a written language, a great change is seen to have been wrought in it. Before the Conquest it was a very highly-inflected, or what is called a synthetic language, that is, one in which the substantives, adjectives, verbs, and articles are subject to numerous modifications, each of which expresses a modification of the root-meaning of the word, or shows the relation of the word to the other words in the sentence. During the period when Anglo-Saxon ceased to a great extent to be a written language these inflections dropped off; and when it re-emerges as a written language about the end of the twelfth century, it is no longer synthetic, but analytic, that is, prepositions and auxiliaries are now used instead of inflectional prefixes and terminations to express the various modifications of the idea contained in any word, and the relations of the words in a sentence to one another. At this period, however, the language still continues to be essentially homogeneous in respect of its vocabulary: the Norman words that occur are so rare that they need not be taken into account. And it was natural that it should be so, for the Saxon language was still confined to the Saxon inhabitants of the country; and those who wrote in it addressed themselves only to that portion of the community, and accordingly had no occasion to use any word of Norman origin. This state of matters lasted till about the middle of the thirteenth century, which is the period at which English proper is usually regarded as having begun to be spoken and written. By this time the Normans began to experience the inconvenience of not being acquainted with the language of the people among whom they dwelt, and in learning to speak and write it they very naturally used a large number of Norman words, and these words were adopted by all such writers belonging to the subject race as wished to make themselves understood by Normans as well as by Saxon readers. A very rapid mixing of the two languages thus took place, and a second important change was wrought in the English language. It is no longer homogeneous in its vocabulary, but contains a large admixture of foreign words. The whole of what precedes may be shortly summarized thus:—From 450 to 1066 the language spoken in England was the so-called Anglo-Saxon, a dialect of

Low German, very highly inflected. From 1066 to 1250 two languages were spoken in England, Anglo-Saxon and Norman-French, by two different sections of the population occupying different political positions. During this period the grammatical structure of the former language began to be broken up, chiefly owing to its being disused for literary purposes; and towards the end of the period we find a few works written in a language resembling the English of our own day in grammar, but differing from it by the homogeneity of its vocabulary. This form of our language is usually called Semi-Saxon. Finally, about 1250 the two languages began to mingle, and form one intelligible to the whole population, Normans as well as Saxons. This is what is usually called English proper. English is thus seen to be a composite language, deriving part of its stock of words from a German source, and part from a Latin source, Norman-French being in the main merely a modified form of Latin. The changes that have taken place in the English language subsequently to 1250 are by no means as striking as those which took place in the transitional period between 1066 and 1250. Some few inflections which the English of the thirteenth and fourteenth centuries still retained have now been dropped, but the chief change which the language has experienced consists in its gradual growth and expansion in obedience to the requirements of advancing science, more complicated social relations, and increased subtlety of thought. This growth has been going on at all times, but there are some periods which may be pointed out as more remarkable than others for the rapidity with which it proceeded. Such a period was the end of the sixteenth and the beginning of the seventeenth century, the period of the Reformation and following the revival of learning, when numerous words of Latin origin were introduced by scholars directly from that language, instead of through the French, the channel through which most of the Latin words previously found in the language had come. Another such period is the present, when the rapid growth of the sciences already existing, and the creation of new sciences, have caused whole groups of words to be introduced, chiefly from the Greek.

It would scarcely be in place here to discuss the various excellencies and defects of the English as compared with other languages, but we may mention the following as among the qualities which the English language is generally allowed to possess. 1. Strength and expressiveness, adapting it admirably for poetical composition. 2. Copiousness. In connection with this may be noted the extraordinary receptivity of the language, that is, its capacity for adopting new words from all sources, and of naturalizing them at once, so that they may be treated without any appearance of strangeness entirely as native English words. 3. Simplicity in form and construction. 4. Great flexibility, or adaptability to all kinds of composition, the grave and gay, the impassioned and calm, forcible and tender, sublime and ludicrous.

In connection with the subject of the English language, we may here further observe, that England and the United States of America offer the first instance in history of two great, independent, and active nations having a *common language*, but situated at a great distance from each other, and daily developing new and characteristic features. These relations must, sooner or later, exert a powerful influence upon the common language; for no language is so stable as not to undergo continual changes, if spoken by a people in the full vigour of social and political life. This state of things has already produced some effect on the English language; but from

the deep and natural interest felt by Americans in the literature of England, which must be a part of their own as long as Shakespeare and Milton shall live in their works, the effect has hitherto been inconsiderable, and not greater than we should expect from the mere circumstance of so different and remote local situations. The most material difference, probably, has been in the pronunciation of the language, which, however important in our daily conversation, is of secondary importance in relation to the literature and written language of the two countries. It has often been observed by English travelers and others that the pronunciation of the United States is far more uniform than that of England; and so nearly alike everywhere, that the people of any one town or district are perfectly understood in every other part of the country, which is not true of the lower ranks in England. When considered more minutely, however, there has for a long time existed a marked distinction between the pronunciation of the New England and Southern states.

The *orthography* of our language has undergone no material change in America, it being the general inclination to follow that of the best English writers of the age. But English orthography is so irregular, particularly in the use of the vowels, as to form the chief difficulty to a foreigner in learning our language, which is in other respects generally regarded as easy of acquisition. The *signs* of the sounds are so inconstant that they do not, when first heard by a foreigner, impress themselves on the memory so distinctly as those of the other European languages do, and of course cannot be so easily remembered for future use. To this embarrassment is to be added our custom of throwing back the accent to the first syllables of words, which necessarily produces that hurried and indistinct utterance of which foreigners so justly complain. For further information respecting the English language, see the article *ANGLO-SAXON*.

2. Literature.—Under this head it is necessary to speak not only of the literature contained in the English language, but also of all that has proceeded from writers who were natives of England, Scotland, or Ireland, whatever may have been the language in which their works were composed. Before any English literature, in the restricted sense of the term, existed, four literatures had arisen in England, of each of which we have some remains, although in the case of one of them, at least, these are rather scanty. The four literatures now alluded to are the Celtic, Latin, Anglo-Saxon, and Anglo-Norman.

The Celtic literature is divided into two branches, the Gaelic and the Cymric. Of the former we have a few remains both in prose and verse, the prose consisting partly of imaginative tales or romances, and partly of annals or chronicles of events of Irish history, and the verse of hymns and other religious as well as secular poems. A number both of the prose and verse pieces in Gaelic receive the name of *Fingalian* or *Fenian*, because they celebrate a legendary hero of the name of Fingal, or Finn Mac Cumhal. Of the other branch of the Celtic literature the chief remains are those ascribed to the four great bards of the Welsh, Aneurin, Taliesin, Merddin or Merlin, and Ilywarch Hen or Ilywarch the Aged. All of these belonged to the sixth and seventh centuries. The authenticity of the remains ascribed to them has been much disputed. Another group of Welsh bards flourished during the twelfth, thirteenth, and fourteenth centuries, but these are by no means so celebrated as the first. In prose, besides chronicles, a code of old Welsh laws, and a large body of triads, that is, notices of historical events, or observations of a general nature, arranged under some common head-

ing in groups of three, there is a collection of imaginative tales, many of which belong to a cycle dealing with the deeds of Arthur, a legendary hero like the Finn Mac Cumhal of the Gaels.

Until the fourteenth century the Latin literature produced in England bore a very considerable proportion to the whole body of literature belonging to that country, and in some departments of literature (theology, philosophy, science, &c.) what was written in Latin had a decided preponderance over what appeared in any other language. The most important of the Latin writers belonging to this period, who were natives of England, Scotland, or Ireland, are Bede, called 'the Venerable' (672 or 673 to 735), a Northumbrian monk, theologian, and scholar; Winfrid, or Boniface, the 'Apostle of the Germans,' who flourished during the first half of the eighth century; Alcuin (735-804), a theologian, scholar, and poet, and minister to Charlemagne; Joannes Scotus Erigena, a philosopher of the ninth century; King Alfred the Great, William of Malmesbury (about 1095-1143), an historian; Geoffrey of Monmouth (died 1154), the celebrated compiler of British legendary history; Nicholas Breakspoor (Pope Adrian IV., the only English pope, 1100 to 1159); Giraldus Cambrensis, or De Barri (died after 1218), an historian and scholar; Matthew Paris (died 1259), an historian; Michael Scott, a Scottish scholar and occult philosopher of the thirteenth century; Roger Bacon (1214-1292), a philosopher and man of science; John Duns Scotus (died 1308), a scholastic theologian; and William Occam (died about 1350), another schoolman, the founder of the sect of the Nominalists.

As there is a separate notice of the Anglo-Saxon literature in the article *ANGLO-SAXONS*, it is enough to mention here the names of Cædmon, Bede, King Alfred, Aldred 'the Glossator,' and St. Dunstan among the writers of pure Saxon, referring to the article mentioned for more detailed information. In the language which in the preceding sketch of the history of the English language has been called Semi-Saxon there are three works of some importance still extant. These are—1. *Layamon's Brut*, a metrical chronicle of legendary British history, consisting of 32,000 verses (about three times as many as *Paradise Lost*), and compiled chiefly from the French by a Worcestershire monk named Layamon who lived about 1200; 2. *The Ormulum*, containing 20,000 verses, a long paraphrase of Scripture, with a commentary, prepared by a monk called Orm or Ormin before the middle of the thirteenth century; 3. *The Ancren Riwe*, the 'Rule of the Anchoresses,' a collection of rules for monastic life written in prose by an unknown writer about 1250.

The literature to which the name of Anglo-Norman is given is that which was written in the Romance tongue called the *Langue d'Oïl*, of which modern French is a development, by writers of Norman descent, who were either natives of England, or although born in Normandy lived during the time when that duchy was closely connected with England. The prevailing character of the Anglo-Norman literature is a tendency towards narrative composition either in prose or verse. From the writers who come under this head the following, all belonging to the twelfth century, may be singled out for their influence on subsequent English literature—an influence due to the fact that it was chiefly they who collected the large body of Arthurian romance, which has since been a common storehouse for English poets. These are Geoffrey Gaimar or Geoffrey of Troyes, author of a metrical version of Geoffrey of Monmouth's *Latin Legendary History*, with a continuation; Wace, author of another version of the same work, which

superseded Gaimar's; Walter Map, or Mapes, and Robert de Borron, to whom are due the best known forms of the Arthurian legends. This literature belongs more properly to French than to English literature.

We now come to English literature in the restricted sense of the term, that, namely, written in the language and written in England without experiencing any great and sudden modification from about the middle of the thirteenth century down to the present day. In this sketch Scottish as well as English writers will be included, as the language formerly spoken in Scotland is as much entitled, from its resemblance to modern English, to have the term English applied to it as the language spoken during the same period in England; and indeed, if we go back to the period of Chaucer and Barbour, we find that the language of the English Chaucer, when compared with modern English, presents even more points of difference than that of the Scottish Barbour. Before the beginning of the fourteenth century the only English writer that deserves mention in this brief sketch is perhaps Robert of Gloucester, and he only on account of his position, as his work, a metrical chronicle, which is nothing else than a free translation of Geoffrey of Monmouth's Latin History, possesses no literary merit. In Warton's judgment the fables often have a more poetical air in Monmouth's prose than in Robert of Gloucester's rhyme. In the next century we meet with the following important names—William Langland, belonging to the latter half of the fourteenth century, John Barbour* (1316-95); John Wycliffe (1324-84), John Gower (died 1408); and Geoffrey Chaucer (1340-1400). Langland is the author of *Piers Plowman*, written in alliterative verse. It is to this poem that one must turn if one wishes to see a true picture of the humbler classes in England during the time at which he writes. The prose work under the name of Sir John Mandevill professes to be by a traveller who recounts all that he had seen and all that he had heard in the East. The work may still be read without difficulty, and it may be remarked generally that the prose of that period presents fewer difficulties to an ordinary English reader than the verse. Wycliffe, the only other celebrated prose writer of this age, was a voluminous writer, but is chiefly known as the translator of the whole Bible into English, probably the first complete English version. The greatest of all the writers of this period is of course Chaucer, who is universally acknowledged to be the greatest of English poets before Spenser, and is still allowed to hold a place in the first rank of British authors. As Langland was the poet of the humbler classes, Chaucer was the court poet of his day. We do indeed find in his *Canterbury Tales* distinct and graphic pictures of English society in nearly all its grades, but these pictures are drawn from the point of view of one in good station, not, as in the case of Langland, from that of one who lived among the humbler classes and shared their sympathies. The subject of Chaucer's great work is such as to afford him an opportunity of depicting the English life of his day in nearly every aspect. It describes a pilgrimage to Canterbury to the tomb of St. Thomas Becket made by a motley company who meet by chance at the Tabard Inn in Southwark, and agree to beguile the way to Canterbury and back by each telling a single tale on the journey to Canterbury and another on the journey back. The prologue to these tales, in which the company is described, is generally looked upon as the most interesting fragment of English literature before the Elizabethan era. This

* Scottish.

work of Chaucer's is unfortunately scarcely half finished.

The period from the time of Chaucer to the appearance of Spenser, that is, from the end of the fourteenth to near the end of the sixteenth century, is a very barren one in English literature. It was a very unsettled period in England. The greater part of the fifteenth century was taken up with war, either foreign or domestic, the first half with the wars in France under Henry V. and Henry VI., and the latter half with the wars of the Roses; and the sixteenth century, embracing the Reformation era, was a time of great political and religious controversy. The consequence of this was that there was little leisure for the production of pure literature. The attention of the ablest men of the time was directed to other objects. Those who did not feel themselves very strongly drawn to any particular mode of life sought distinction in the manner in which it was most readily to be attained—in the fifteenth century in warfare, and in the next by taking part in the controversies then raging. Such literature as we have in England during this period is accordingly chiefly of a polemical nature, including satire, the form which poetry most naturally assumes in such an epoch. The only writers worth mentioning of this period belonging to the department of pure literature are Sir Thomas More (1480-1535), author of *Utopia*; the dramatist John Heywood (died about 1565); the poets Sir Thomas Wyatt (1503-42) and Henry Howard, earl of Surrey (born about 1516; beheaded by Henry VIII. in 1547); and the scholar Roger Ascham (died 1568). Heywood deserves mention merely as the writer of a kind of plays called 'interludes,' which form the transition between the old mysteries and moralities and the modern form of the drama. The Earl of Surrey is usually held to be entitled to the honour of having introduced blank verse into English, namely, in his translation of the second and fourth books of Virgil's *Æneid*, but this honour has also been claimed for Chaucer, whose two prose tales in the *Canterbury Tales* ought, it is said, to be printed in the form of blank verse, not prose. Against these three writers in the department of pure literature there might be placed a long list of authors whose works are of a polemical nature, religious, political, or both, but it is sufficient to mention the following: John Fisher, bishop of Rochester (1459-1535); Sir Thomas More, already mentioned in the department of pure literature; William Tyndale (about 1485-1536) and Miles Coverdale (about 1485 to about 1565), translators of the Scriptures; Hugh Latimer, bishop of Worcester (burned 1555); Nicholas Ridley, bishop of London (burned 1555); and Reginald Pole, cardinal and archbishop of Canterbury (1500-58). To these may be added the satirist John Skelton (about 1460-1529).

The period of which we are now speaking, in England the most barren in pure literature, is, on the contrary, one of the richest in Scotland. The Scottish writers include King James I. (murdered 1437), Blind Henry the Minstrel (flourished about 1460), William Dunbar (born about 1485; died about 1520), Gavin Douglas, bishop of Dunkeld (born about 1474; died 1522), translator of Virgil's *Æneid*, Sir David Lyndsay (about 1490 to about 1555), John Knox (1505-72), and George Buchanan (1506-82).

The next period, that which opens with Spenser, the most poetical of poets, is known as the Elizabethan age, and is the brightest in English literature—an age in which a greater number of intellects of the first order were clustered together in the ranks of literature than at any other period since the time of Pericles. Poetical literature is throughout pre-

dominant, and it would fill nearly a column merely to enumerate the poets, all more or less distinguished, that flourished in this age. If the poets be separated from the dramatists, the greatest of them all is beyond all question Edmund Spenser (1552 or 1553-99), the author of the *Faerie Queene*; and the majority of the other poets may be classed as Spenserians or imitators of Spenser. Among these are the two personal friends of Spenser—Sir Walter Raleigh (1552-1618), an historian as well as a poet, and Sir Philip Sydney (1554-86), also both a poet and a prose writer; and in addition to these two Edward Fairfax (died about 1632), the translator of Tasso, Michael Drayton (1563-1631), Giles Fletcher (died 1623), Phineas Fletcher (about 1584 to about 1650), and William Drummond* of Hawthornden (1585-1649). During this period there also flourished a peculiar class of poets, by Johnson called metaphysical. These are scarcely entitled to the appellation of poets in the strictest sense of that term, being rather ingenious thinkers, who use verse as the medium of expression for thoughts more quaint and fantastic than could be suitably expressed in prose. Such are Sir John Davies (died 1626), author of the *Immortality of the Soul*; Dr. John Donne (1573-1631); Francis Quarles (1592-1644); and George Herbert (1593-1633). The last two show a preference for subjects of a religious nature. There are still two poets belonging to neither of the preceding classes that ought not to be omitted. These are the satirists Bishop Joseph Hall (1574-1656), to whom the epithet of the English Persius is sometimes attached; and George Wither (1588-1667). The former is also celebrated as an ecclesiastical writer, and the poetry of the latter is not entirely satirical. Most of the best extant ballads, both English and Scottish, also belong to this age, or perhaps one somewhat earlier, although the older form of Chevy Chase, the most famous of them all, is probably as old as the time of Henry VI. See CHEVY CHASE.

The Elizabethan age is also the golden age of the English drama. It includes among the dramatists William Shakespeare (1564-1616), whom it is almost superfluous to mention; as well as Christopher Marlowe (died 1593), author, among other pieces, of *Dr. Faustus*, to which Goethe was indebted, in no inconsiderable degree, in his drama on the same subject; Ben Jonson (1574-1637); John Fletcher (1576-1625) and Francis Beaumont (1586-1615); Philip Massinger (1584-1640); John Ford (1586 to about 1640); some of whom are of so high an order that they would be classed as minor dramatists only in the age which produced Shakespeare.

The list of great names belonging to this age is not exhausted until mention is made of Francis Bacon, Lord Verulam, Viscount St. Alban's (1561-1626), who is, on the one hand, still looked up to by at least one school of philosophers as in some sense the founder of modern philosophy, as having given to philosophy a new starting-point and a new method; and, on the other hand, claims more general admiration as a thinker and observer, and as a master of pithy and pregnant English. By scholars he is not less admired for the excellence of his Latinity. Although Bacon did indeed live in part during the reign of Elizabeth, and produce some of his works during that part of his life, yet as his greatest works were produced during the reign of James, it may be questioned whether he ought, strictly speaking, to be classed among the Elizabethan writers. Perhaps it is more correct to regard him as belonging, with several others of those mentioned above, to what has been called the 'afterglow of the Elizabethan age'—an epoch still bright in English literature, but in some

degree eclipsed by the exceeding splendour of the one immediately preceding.

During a portion of the seventeenth century the production of pure literature was interrupted in a similar way to that in which it was interrupted between the time of Chaucer and that of Spenser, namely, by the unsettled state of the country, only in this case the interruption lasted for a much shorter time. The period referred to is that between 1640 and 1660, from the assembling of the Long Parliament to the Restoration, when pure literature was displaced by floods of controversial writing on religious and political subjects. Sir Thomas Browne (1605-82) was almost the only writer of note who continued during this period of civil strife and commotion to meditate in retirement and commit his meditations to paper undisturbed by what was going on around him. Some of the chief works of Hobbes (1588-1679) were, it is true, written during this period, but then they were written abroad. The rest of the seventeenth century is rich both in verse and in prose. In the latter respect it has been said to be deficient, but De Quincey avers, on the contrary, that in prose it 'produced the highest efforts of eloquence (philosophic, but at the same time rhetorical and impassioned) which our literature possesses. Donne, Chillingworth, Sir Thomas Browne, Jeremy Taylor, Milton, South, Barrow,' he adds, 'form a pleiad, a constellation of seven golden stars such as no literature can match in their own class.' Among the other prose writers of this century are Robert Burton (1576-1640), author of the *Anatomy of Melancholy*; Edward Hyde, Lord Clarendon, the historian (1608-74); Thomas Fuller (1608-61), the author of *Church History*, &c.; John Bunyan (1628-88), author of the *Pilgrim's Progress*; Anthony Wood (1632-95), the minute and careful historian of Oxford; and representing philosophy (in addition to Hobbes, already mentioned) there are the two so-called 'Cambridge Platonists,' Henry More (1614-87) and Ralph Cudworth (1617-88); and John Locke (1632-1704), the author of the *Essay on the Human Understanding*. The two greatest poets of the century are John Milton (1608-74) and John Dryden (1631-1700). Professor Masson has remarked that the career of Milton presents a curious illustration of the tendency there is in periods of great internal commotion in any country for great minds to be drawn off from pure literature. In his youth Milton was a poet; from 1640 to 1660 a prose polemical writer, and from 1660 to 1674 again a poet. Besides these two great poets there are other two who ought not to be passed over, Samuel Butler (1612-80), author of the *Hudibras*, a satire on the Puritans; and Abraham Cowley (1618-67), the most important of the so-called metaphysical poets since Donne.

The eighteenth century is one that is often pointed out as one of general declension, in England as well as elsewhere, and perhaps if we confine our attention to literature, the remark will not seem unfounded. A few of the leading writers in the several departments of literature may be mentioned. It will be noticed that Scottish and Irish writers now begin to take a prominent place in English literature. In the following lists Scottish writers are distinguished by *, Irish by †, American by ‡. In poetry and imaginative literature we have Daniel Defoe (about 1660-1731), novelist; Dr. Jonathan Swift† (1667-1745), satirist and novelist; Joseph Addison (1672-1719), imaginative prose writer and dramatist; Allan Ramsay* (1686-1758); John Gay (1688-1732); Alexander Pope (1688-1744); Samuel Richardson (1689-1761), novelist; Robert Blair* (1699-1746 or 1747); James Thomson* (1700-48); Henry Fielding (1707-54), novelist; Lawrence

* Scottish.

Sterne (1713-68), novelist; William Shenstone (1714-63); William Collins (1720-56); Tobias Smollett* (1721-71), novelist; Oliver Goldsmith* (1728-74), poet and novelist; William Cowper (1731-1800); Richard Brinsley Sheridan* (1751-1816), dramatist; Robert Ferguson* (1750-74); Thomas Chatterton (1752-70); George Crabbe (1754-1832); and Robert Burns* (1759-96). The chief historical writers are David Hume* (1711-76); William Robertson* (1721 or 1722-91); and Edward Gibbon (1737-94); along with whom may be classed James Boswell* (1740-95), the biographer of Johnson. The chief philosophical and expository writers include Sir Richard Steele* (about 1670-1729), essayist; Bernard de Mandeville (about 1670-1733); Joseph Addison, essayist; George Berkeley, bishop of Cloyne (1684-1753), the idealist philosopher; Joseph Butler (1692-1752); Jonathan Edwards* (1703-58), theologian; David Hartley (1705-57); Dr. Samuel Johnson (1709-84); Dr. Thomas Reid* (1710-96); David Hume*; Adam Smith* (1723-90); Edmund Burke* (1729-97); Jeremy Bentham (1749-1832); and Dugald Stewart* (1753-1828). Finally, in the department of scholarship the chief are Richard Bentley (1662-1742); Sir William Jones (1746-94); and Richard Porson (1759-1808).

In the nineteenth century a considerable proportion of American authors must also be included among the producers of English literature. Following the same classification for this century we have among the poets and imaginative writers Samuel Rogers (1763-1855); Maria Edgeworth (1767-1849), novelist; William Wordsworth (1770-1850); Sir Walter Scott* (1771-1832); Samuel Taylor Coleridge (1772-1834); James Hogg* (1772-1835), the Ettrick Shepherd; Robert Southey (1774-1843), poet and miscellaneous writer; Charles Lamb (1775-1834), essayist; Walter Savage Landor (1775-1864); Thomas Campbell* (1777-1844); Thomas Moore* (1779-1852); Washington Irving* (1783-1859), novelist, &c.; Lord Byron (1788-1824); J. F. Cooper* (1789-1851), novelist; Percy Bysshe Shelley (1792-1822); Mrs. Hemans (1794-1835); John Keats (1796-1821); William Cullen Bryant* (1794-1878); Thomas Hood (1798-1845); Nathaniel Hawthorne* (1804-64), novelist; Lord Lytton (1805-73), poet and novelist; Benjamin Disraeli (1805-81), novelist; Henry Wadsworth Longfellow* (1807-82); O. W. Holmes* (1809-94), poet and essayist; Alfred Tennyson (1809-92); Edgar Allan Poe* (1811-49), poet; William Makepeace Thackeray (1811-68), novelist; Charles Dickens (1812-70), novelist; Robert Browning (1812-89); Elizabeth Barrett Browning (1809-61), poetess; Harriet E. B. Stowe* (1812-96), novelist; William Edmonstone Aytoun* (1813-66), poet and writer of tales; James Russell Lowell* (1819-91), poet and miscellaneous writer; Charlotte Brontë (1816-55), novelist; Mary Anne Evans, better known as George Eliot (1820-80), novelist; Matthew Arnold, poet and essayist (1822-88); Arthur Hugh Clough, poet (1819-61); Coventry Patmore, poet (1823-96); Dante G. Rossetti, poet-painter (1828-82); Robert Buchanan, poet and dramatist (1841-1901); William Morris, poet (1834-96); Sir Lewis Morris, poet (born 1834); Algernon Charles Swinburne, poet and critic (born 1837). Among the more recent novelists are Anthony Trollope, Charles Reade, Wilkie Collins, George MacDonald, R. D. Blackmore, Thomas Hardy, Mrs. Oliphant, George Meredith, William Black, Baring Gould, Sir Walter Besant, R. L. Stevenson, Rudyard Kipling, J. M. Barrie, Miss Braddon, Mrs. Craik, Mrs. H. Ward, &c. The nineteenth century may be designated as the age of the novel, Scott, Dickens, and Thackeray being pre-eminent names. Foremost among the poets are

Shelley, Keats, Byron, Scott, Tennyson, and Browning. Among the historians are Dr. John Lingard (1771-1851); James Mill* (1773-1836); Henry Hallam (1777-1859); Henry Hart Milman (1791-1868); Sir Archibald Alison (1792-1867); George Grote (1794-1871); Thomas Carlyle* (1795-81); William Hickling Prescott* (1796-1859); Connop Thirlwall (1797-1875); Lord Macaulay (1800-59); George Bancroft* (1800-91); Alexander William Kinglake (1811-90); John Hill Burton* (1809-81); John Lothrop Motley* (1814-77); Sir Arthur Helps (1817-75); E. A. Freeman (1823-92); James Anthony Froude (1818-94); and Thomas Henry Buckle (1822-62). Among the philosophical and expository writers are Sir James Mackintosh (1765-1832); Rev. T. R. Malthus (1768-1834), political economist; John Foster (1770-1843), theologian and essayist; Rev. Sydney Smith (1771-1845), essayist and critic; S. T. Coleridge; Francis Jeffrey* (1773-1850), critic; James Mill* (1773-1850), critic; William Hazlitt (1778-1830), critic; Dr. Thomas Brown* (1778-1820); Lord Brougham* (1779-1868); Dr. Thomas Chalmers* (1780-1847); Sir David Brewster* (1781-1868), scientific writer; Thomas De Quincey (1785-1859), essayist and critic; Richard Whately (1787-1863); Sir William Hamilton* (1788-1856), philosopher; Sir John Herschel (1790-1871), scientific writer; Hugh Miller* (1802-56), geologist; Ralph Waldo Emerson* (1803-82), essayist and miscellaneous writer; John Stuart Mill (1806-73), philosopher and economist; James David Forbes* (1809-68), scientific writer; Sir Charles Lyell*, geologist (1797-1875); Charles Robert Darwin (1809-82), scientific writer; John Ruskin (1819-1900), writer on art, economics, and general subjects; Herbert Spencer (born 1820), scientific and philosophical writer; John Tyndall (1820-94) and Thomas Henry Huxley (1825-95), scientific writers. In the department of scholarship there are Sir Henry Rawlinson (1810-95); John William Donaldson (1811-61); John Conington (1825-69); and H. A. J. Munro* (1819-85). Finally, a few of those who have written works of travel may be mentioned, such as David Livingstone* (1815-73); Sir Richard Francis Burton (1821-90); Sir Samuel White Baker (1821-93); and Sir Henry Morton Stanley (born 1840).

In the following list the most important reviews and magazines are mentioned (see also PERIODICALS): The Gentleman's Magazine (begun in 1731); the Monthly Review (begun in 1749, discontinued in 1845); the Critical Review (begun January, 1756, discontinued June, 1817); the British Critic (begun in 1793, and discontinued in 1843); the Edinburgh Review (begun in 1802); Quarterly Review (begun in 1809); the North American Review (begun in 1815); Blackwood's Magazine (begun in 1817); the Retrospective Review (begun 1820, discontinued 1828); the Westminster Review (begun in 1824); the Foreign Quarterly Review (begun in 1827, incorporated with the Westminster in 1846); the Athenaeum, a weekly critical journal (begun in 1828); Fraser's Magazine (begun 1830, discontinued 1882); North British Review (begun 1844, discontinued February, 1871); the Atlantic Monthly (begun 1857); Fortnightly Review (begun in 1865); the Academy, a weekly critical journal (begun in 1869); Contemporary Review (begun in 1866); Cornhill Magazine (begun in 1860); Macmillan's Magazine (begun in 1859); Nineteenth Century (begun in 1877); Chambers's Journal; The Leisure Hour; Good Words; Temple Bar; The Century Magazine; Scribner's Magazine, &c. &c.

For the manufactures and commerce see *BRITAIN*; also articles *COTTON*, *LINEN*, *IRON*, *WOOL*, &c.

An account of the government and constitution of

England will be found in the article **BRITAIN**, section **British Constitution**.

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ENGLAND, NEW. See **NEW ENGLAND**.

ENGLISH CHANNEL, the sea which separates England from France, extending, on the English side, from Dover to the Land's End; and on the French, from Calais to the Island of Ushant. On the east it communicates with the German Ocean by the Strait of Dover, 21 miles wide; and on the west it opens into the Atlantic by an entrance about 100 miles wide. At its greatest breadth it is about 150 miles. On the English side, off the coast of Hampshire, lies the beautiful Isle of Wight; while Guernsey, Jersey, and the other Channel Islands are situated off the French coast. The pilchard, and mackerel, and oyster fisheries in the Channel are very important.

ENGRAVING, in the primitive sense of the term, denotes the art of representing objects and depicting characters on metal, wood, precious stones, &c., by means of incisions made with instruments variously adapted to the substances operated upon, and the description of work executed. The different inventions, however, which superseded graving or insising, led to the word being used in a wider sense; and though yet strictly applicable, in its original meaning, to seal or gem engraving, to die-cutting, and wood engraving, it now comprehends all works of art executed on plates intended for printing, by whatever means they are produced. Impressions from metal plates are named engravings, prints, or plates; those printed from wood being called indifferently wood engravings and wood-cuts.

Abundant evidence that engraving was cultivated in some of its higher forms at very remote periods is presented to us in the clear allusions to the art found in the most ancient writings, sacred and profane, and also in the relics collected from time to time, and deposited in almost every museum in Europe. The reference in the book of Exodus to the engraving on the precious stones and plate of gold adorning the breastplate, ephod, and 'holy crown' of Aaron the high-priest, and Homer's enumeration of the objects represented on the shield of Achilles, are familiar written proofs of its great antiquity. The discoveries among the ruins of ancient Egypt, of Greece and Etruria, the later excavations in Herculaneum and Pompeii, and, still more recently, in the long-buried ruins of Nineveh and Babylon, place before us the works of the old-world engravers, each impressed with a style of design and execution peculiar to the country and age which produced them.

An historical notice, comprehending all branches of the art, however slightly treated, would exceed our limits; but the great development of wood engraving and plate engraving, and the important educational purposes they now subserve, calls for a brief inquiry into their rise and progress.

Engraving on wood, intended for printing or impressing from, long preceded copperplate engraving. It has also the honour of having suggested the grand

discovery of printing with movable types. The art is of eastern origin, and we learn from undoubted authority that so early as the tenth century engraving and printing from wood blocks was common in China. We first hear of wood engraving being cultivated in Europe by the Italians and Germans in the thirteenth century, their manner of operating closely resembling that practised in China.

Papillon, the French historian of the art, gives the names of Alessandro Cunio, and his twin sister Isabella, Venetians of noble family, who lived in the latter half of the thirteenth century, as the earliest known designers and engravers on wood.

No records are found of engraving being practised during the next 150 years; but following this period, and down to the seventeenth century, Italy, Germany, France, and Holland produced many artists who successfully cultivated the art. It is to Germany, however, we are indebted for the choicest specimens of early wood engraving; and among these the works of Albert Durer stand pre-eminent for delicate yet spirited execution. Towards the end of the seventeenth century copperplate engraving began to supersede engraving on wood in many of the uses to which the latter had been applied. From that time few wood engravers of any note appeared, until the increasing demand for illustrated works about the close of the last century caused a revival of the neglected art, which has since continued to expand and so develop its resources that its productions, now scattered abroad in boundless profusion, are brought within reach of all, enriching alike the costly volume and humble periodical.

The first English engravers on wood worthy of notice are Edward Kirkall, born in 1695, and John Baptist Jackson, who died in 1754. But the art had no real vitality in England until the brothers Bewick, about the close of last century, founded the English school of wood-engraving, which has since attained a position second to no other—the works of many eminent English engravers taking rank among the finest specimens of the art.

Copperplate engraving arose in the fifteenth century. Until then the art of engraving on metal had been confined to decorating sacred vessels, armour, services of plate, &c., with emblematic figures, and other pictorial and ornamental devices. A very ancient practice was to fill the engraved lines of these ornaments with different coloured metals, and similar to this inlaying was the 'working in niello' extensively practised throughout Europe in the fourteenth and fifteenth centuries, which consisted in filling the engraved lines with a dark metallic enamel, composed of silver, lead, copper, sulphur, and borax.¹ The engravers, who were also the fabricators of the articles they thus decorated, generally secured duplicates of their works before laying in the niello, by filling the lines with dark colour, and taking casts of them in sulphur. Ultimately this practice suggested the practicability of taking impressions upon paper, a discovery which led to engraving upon copper plates solely for the purpose of printing from.

Although the prior discovery has been claimed for German artists, it is now generally agreed that the practice was first established by the Florentine goldsmith and engraver Finiguerra, an impression from one of his works having been recognized as produced

¹ This compound was reduced to a powder, fusible at a heat much lower than is required to melt silver. The method of filling in the lines was by spreading the niello over the engraved surface, and heating the plate till the powder melted and ran into the lines. When the metal cooled the superfluous niello was scraped off, and the surface burnished, the full effect of the design being thus brought vividly out by the contrast of the dark lines with the light metal.

in 1440, the date of the earliest German print being 1460. The new art had, however, very soon spread over Italy and Germany, for before the close of the century many eminent engravers had risen in both countries. Among Italian artists of the period the highest place is assigned to Marc Antonio Raimondi, who, under the superintendence of Raffaele, engraved many compositions of that prince of painters. In the early German school we again find the genius of Albert Durer directed to engraving on copper with a success equal to that in his wood-engraving. Though the Italian works excelled in grace of outline and beauty of expression, it is still to Germany we must look for the most finished execution in early copper-plate engraving. Towards the end of the fifteenth and during the first half of the sixteenth century many Dutch and Flemish, and a few French artists, attract attention by the merit of their works; but the period most prolific in able engravers of the early schools was between 1550 and 1640, when a host of Italian, German, Dutch, Flemish, and French engravers arose, whose works are still highly prized.

For a considerable time after the introduction of the art nothing higher was aimed at than an imitation of pen-and-ink drawing. Raimondi, and especially Durer, made great advances beyond this; but it was reserved for the Dutch engraver Cornelius Cort, about the end of the sixteenth century, to introduce a higher style, in which a broader and more forcible treatment of light and shade, and a bolder and freer execution were adopted.

Although etching was practised at an early period of the art by Albert Durer and others, its combination with graver work was rarely, and very partially, had recourse to until the end of the seventeenth century. Prior to that time the graver was almost exclusively employed in the finest works, and little more than a century has elapsed since the successful union of the two methods supplied what had been wanting to make the art a full and faithful reflex of painting.¹ It is to be remarked, however, that though dry and poor in style, the plates of the early engravers generally exhibit a vigorous accuracy of drawing, and a dignified grace of expression not surpassed in the best prints of later times, many of these fathers of the art having been eminent as painters; and the works of the least conspicuous among them show a knowledge of the higher principles of art less frequently met with in the more elaborate modern plates.

A perceptible change in style about the end of the seventeenth century marks the rise of the modern continental schools of engraving. Since then the artists of France, Italy, and Germany, have rivalled each other in producing many noble specimens of their skill and industry. Among those masters whose works elevated the art and formed the style in their several countries, the names of Wille in France, Morghen in Italy, and Müller in Germany, may be cited as the most prominent.

Britain possesses no early engravers in the simple style worthy to rank with the continental masters; and it was not until the middle of the seventeenth century that a few English and naturalized foreign artists, by their successful cultivation of the compound process, gave an impulse to the art, which had hitherto languished in complacent mediocrity. The succeeding century produced many native engravers who contributed to raise the British school to high

eminence. The most celebrated of these, Sir Robert Strange and William Woollet, may be regarded as the founders of Britain of the styles in which they respectively excelled. The plates of Strange and Woollet compare advantageously with the best preceding and contemporary works of the Continent, and are still unsurpassed in many essential qualities. The style adopted by these eminent masters has been followed, and in some respects improved upon by their successors; its character is distinguished by great freedom, boldness, and variety of lines, and a certain studied looseness in their disposition. Modern British engravers have given more attention to varied texture and tone than their continental rivals, the result being a peculiar richness and feeling of colour never before so perfectly obtained in engraving.

The preceding sketch of copperplate engraving refers chiefly to engraving in lines, and it remains shortly to notice other methods invented at later periods with the view of lessening the labour while producing effects unattainable by the established process. These may be separated into three divisions—Stipple, Mezzotinto, and Aquatinta. Modifications of each have from time to time engaged the attention of engravers and others, but are now seldom practised; Mezzotinto alone having taken a very effective form under the name of the Mixed style, extensively employed in large works.

The Stipple manner only assumed the position of a fixed style about the middle of last century. A few French, Dutch, and English engravers adapted it with some success to the imitation of chalk drawings—hence the name *chalk style*—but it is in Britain alone that full advantage has been taken of its peculiar resources. Bartolozzi established the method in England, and it has since been practised with signal success by many native artists.

The invention of Mezzotinto has been ascribed to the cavalier general, Prince Rupert. Later authority, however, assigns the honour to a German soldier, Col. von Seigen, from whom, it is alleged, Prince Rupert borrowed his knowledge of the process. A number of engravers in Holland, Germany, and England, soon adopted the new style, but it does not seem to have found favour with the Italian and French artists of the period. Subsequently the engravers of France made considerable progress in mezzotinto, but it may be safely affirmed that its finest examples have been executed by British artists. Since about the year 1830 it has gradually merged into the mixed style, and purely mezzotinto plates are now rarely produced.

Aquatinta is the latest of these inventions, and its author seems to have been the Abbé de St. Non, a French litterateur and amateur engraver, who flourished in Paris about the middle of last century. This manner is best suited to prints intended for colouring; and fair imitations of water-colour drawings may be produced by adapting the process to printing in colours. Like mezzotinto, it has generally fallen into disuse as a distinct branch of engraving.

Until about the year 1820 copperplates were always used for engraving upon; but about this period the growing necessity for large numbers of good impressions being printed from one plate led to the use of steel as a substitute.² Within a very few years the superiority of steel, both as allowing tenfold the

¹ In the early times of the art, and generally down to the period stated above, the outline was transferred to a thin coating of bees-wax spread over the plate, and, being gone over with the point and lightly scratched into the copper, the wax was cleaned off, and the subject laid in with lines and shaded entirely with the graver.

² The introduction of steel is generally admitted to be owing to Mr. Perkins, an American gentleman, whose discovery included an ingenious method of transferring, by a simple mechanical process, the engraving from the plate after hardening it, to a soft steel roller, which, hardened in turn, is used to re-transfer the work to an indefinite number of softened steel plates. This practice, beset with difficulties in the hardening process, obtains largely in America.

number of good impressions, and as admitting higher finish, caused it to be used exclusively for all fine works of limited size; but the early difficulties of working it having been conquered, steel has, for many years, been used in works of the largest dimensions. The introduction of steel gave a great impetus to the art, and in no period of its history has it been so widely diffused, or so many works of the highest class produced.

In proceeding to describe the methods and the instruments employed in the different styles, we give precedence to Line-engraving, not only on account of its demanding greater manipulative skill, and that in it the highest triumphs of the art have been achieved, but also because a description of the tools and many of the processes will include those used in most of the other branches.

Line-engraving, as implied by the term, is executed entirely in lines. The tools are few and simple. They consist of the graver or *burin*, the point, the scraper, and the burnisher; an oil-stone or hone, dividers, a parallel square, a magnifying lens, and a blind, or shade of tissue paper, to make the light fall equally on the plate. For levelling important erasures there are used callipers, a small steel anvil, a small pointed hammer, and punches. The *graver* is a small quadrangular bar of finely-tempered steel, curved slightly upwards; it varies in shape from a perfect square to an acute lozenge; the cutting end, or face, is ground with a backward slope, while the belly, or undermost and cutting angle, is whetted to a smooth but not very keen edge. It is fixed in a short pear-shaped handle of hard wood, the under side being made flat to allow the graver to lie nearly parallel with the plate when used. The rounded end leans against, and is pushed forward by the back part of the palm of the hand, while the smaller end, and the graver itself, are grasped and guided by the thumb and all the fingers, which rest on each side, but must not extend below or round the instrument. The *point* is a cylindrical piece of fine steel, a little thicker than a stout darning-needle, inserted in a wooden handle about 5 inches long. It is used in the manner of a pen or pencil. The *scraper* is a triangular steel instrument, about 3 inches long and a quarter of an inch broad, tapering to a point. It is used to scrape off the burr cast up on the sides of the cut lines, and to make erasures. The *burnisher* is made of very hard steel, finely polished, elliptical in shape, and pointed. Its use is to burnish the plate and to make small erasures; but it is also an important auxiliary in finishing and giving tone to the work. In etching, the following articles are required:—a resinous mixture called etching ground, capable, when spread very thinly over the plate, of resisting the action of the acids used; a dauber for laying the ground equally; a hand-vice; some hair pencils of different sizes, and bordering wax, made of burgundy-pitch, bees'-wax, and a little oil. *Common etching ground*, which is that most generally used, is composed of three parts asphaltum, two parts burgundy-pitch, and one and a half part virgin wax. These are carefully melted in an earthen pipkin, and when thoroughly incorporated, the mixture is poured into water and kneaded into small balls, which are tied separately up in stout silk when used. The *dauber* is made by tying up lambs' wool in fine muslin with a circular piece of card-board about 3 inches in diameter on one side, thus forming a pad, flat behind, rounded on the face, and about 1 inch thick. This is covered with well washed, stout, used silk, pulled tightly over the rounded face, and secured behind with thread.

On commencing a plate, the first procedure of the engraver is to make a careful outline of his subject

upon thin paper, with a black-lead pencil. If a painting is to be copied, or a drawing that is larger than the intended plate, the following method is taken to insure perfect accuracy in the reducing:—The picture is overlaid with two rows of fine white threads, drawn tightly across its face, crossing each other at right angles, and at regular distances marked by the dividers; thus forming a series of perfect squares all over it. An exactly similar number of squares corresponding with the size of the intended plate are then drawn on paper with faint colour, or by a blunted point. The squares on the picture and on the paper are numbered alike, and it is then a comparatively easy task for a skilful draughtsman to transfer to each square on the paper a minutely accurate outline of the objects contained within the corresponding squares on the picture. Should the original be a drawing or a print the same size as the intended engraving, the outline may be traced through on transparent paper, but it must be revised and perfected after tracing. The next step is to lay the *ground* on the plate; and an essential preliminary is to thoroughly cleanse its surface. Copper is effectually cleaned by a mixture of fine whiting and turpentine spread over the heated plate, and when the turpentine evaporates, wiping off the whiting with clean rag. The most efficient means of cleaning a steel plate is a strong ley, or solution of the common black ashes of the shops, and turpentine. With this mixture the plate is repeatedly washed, and each time rinsed with cold water; finally, it is rubbed dry with a scrupulously clean cotton rag. The hand-vice is now attached to one corner of the plate, a small thick fold of paper protecting the face at that part; then the plate is laid face upwards on a moderately hot iron; or, better still, a tin box filled with water, kept boiling by a charcoal stove, or spirit-lamp beneath. By this latter contrivance all risk of burning the ground, and thus making it unfit for etching, is avoided. When the plate is hot enough, the ball of etching ground is rubbed over the surface, the heat causing it to melt and ooze through its wrapper of silk. The ground is then spread by light and rapid strokes with the rounded face of the dauber, continued until every part is thoroughly covered with an equal thin coating. The ground must now be smoked while the plate is hot, by holding it face downwards, and passing the flame of two or three wax tapers loosely tied together, rapidly to and fro and across its surface, till it becomes a clear shining black; but care must be taken not to burn it, by permitting the flame to rest an instant on one place. The plate being cooled the paper on which the outline is drawn is damped, placed carefully face downwards on the plate, and secured in its position by small bits of bordering wax; another piece of paper, also damped, is next laid over it, and the whole passed through the roller-press used for printing plates. When the paper is lifted off, the pencil outline is found transferred in *reverse* to the shining black surface in clear silvery lines.

*Etching*¹ now follows: and to protect the outline and ground during the process, supports made of paper, wood, or leather, about one-eighth of an inch thick, are fixed on the margin; resting on these the parallel

¹ The word 'etching,' taken in the sense of the German *Ätzen*, from which it is derived, merely signifies corrosion; but its meaning, as now applied by engravers, refers only to drawing with the point, through the ground, the lines forming the shading. Corrosion, the second part of the process, is called *bitting*. Thus, it is said that a plate 'is etched, but not yet bitten,' or, 'it is both etched and bit.' The great superiority of modern landscape plates over those of the early schools, is owing to the bold freedom of handling which etching permits.

square is laid across the plate for the twofold purpose of supporting the hand and of guiding the Point. In a landscape, outlining and etching in the parts go on simultaneously; but in an historical piece the outline must first be secured by dotting it in carefully with the point, and then all parts of the subject it is desirable to etch are proceeded with. In etching landscape upon copper the more delicate light parts of the shading are left to be put in afterwards with *dry point*—that is, by lines cut into the bare metal with the point alone; but on steel, all parts except the highest lights are etched and *bitten*. The lines in a landscape plate are diversified according to the nature of the objects represented. The atmospheric effect of the sky, and extreme distance, is produced by straight or waved parallel lines laid close together; the middle distance is treated in a nearly similar manner, but the lines are wider apart, rougher, and not so uniformly parallel. Foliage is represented by short quick curves and angular forms, almost infinite in variety; grassy surfaces by similar lines, but more continuous and parallel; rough ground, rocks, and ruins, by a mixture of curved and angular lines, parallel, involved, and broken, according to the character of the object; architecture by waved or straight parallel lines; water at rest, by lines straight, horizontal, and parallel; and water in motion by waved and curved lines.

In an historical plate, the landscape and other accessories are treated with lines similar to, but generally more formally disposed than in a purely landscape plate.

In etching skies, distance, buildings, water, interior walls and furniture, drapery, &c., in which the lines, straight, waved, or curved, are parallel or nearly so, the point is leaned against, and moved along the edge of the square; but in all other cases the square is merely a rest for the hand, the point being used freely like a pen or pencil. None of the etched lines or dots are properly cut into the plate; the pressure should be merely enough to penetrate the *skin* of the metal, insuring the entire removal of the ground, so that the subsequent action of the acid may be quite unobstructed. Should any error occur in etching, a little of the ground, thinned with turpentine, is laid over the part with a hair pencil, and when dry it is re-etched.

Biting-in.—When the etching is completed the supports are taken off, and the *bridge*—a thin board, having cross pieces about one inch thick under each end—is laid across the plate to support the hand. The margins are then painted over with a varnish of brunswick black thinned with turpentine, the entire surface of the ground carefully examined, and all breaks or scratches pencilled over with the varnish which resists acid equally with the ground. When this hardens, a wall of bordering wax about an inch high is placed round the subject, and pressed firmly down on the plate to retain the acid which is now applied. It must be borne in mind that the spaces between the lines, however narrow, and all parts not touched with the point, are protected from the action of the acid by the ground. Nitrous acid mixed with three or four parts water and a little sal-ammoniac is used to corrode copper. When poured on, small bubbles of fixed air rise out, and collect upon the lines; these must be continually brushed off with a soft feather, otherwise foul or irregular biting ensues. A quarter of an hour generally suffices to corrode the lightest parts to a sufficient depth and breadth. The acid is then poured off, the surface of the plate washed with clean cold water, and gently dried with blotting paper, or by the wind of a pair of bellows. A small piece of the ground is now scraped off the light parts to ascertain if they

are the desired strength; if found to be so they are stopped-out—that is, covered with the varnish. When this dries the acid is again poured on, and remains till the next degree of strength is got; this process is repeated till all the successive degrees of dark are obtained. A little oil is now poured on to neutralise any remains of acid, the bordering wax taken off by a gentle heat, the plate washed with turpentine, and cleaned with rag and oil. The process of biting steel is similar to that described above, but a different acid is employed, and more care exercised on account of the rapid action of the acid. The mixture generally used is one part nitric acid to three or four parts strong acetic acid. This acts very quickly on steel, a second being sufficient for the lightest, and a few minutes for the darkest parts.

The biting-in being accomplished, a proof¹ is got preparatory to the next step towards completion. In a landscape the prelude to this is generally to lay in the sky, if not etched with the rest of the subject; a second ground, outline, and biting-in being necessary. The other parts of the landscape are now gone over with the graver, broken lines are led into each other, and the forms of objects more defined. The artist then proceeds to give the gradations of shading and strong darks which cannot be got by a first biting. This, which was formerly the work of the graver alone, is now done with a tithe of the labour by *re-biting*, an invention said to be purely English, and dating only from about 1760. For this process the plate must be cleaned with extra care, and the lines cleared out with crumb of stale bread. The ground is melted only on the margins of the plate; it is taken up gradually with the dauber, and conveyed to the parts to be rebitten by very light and rapid strokes, till all the spaces between the lines are perfectly covered; but not a particle of the ground must enter the lines. Varnishing, biting, &c., are precisely the same as before. The finishing is now proceeded with by crossing the sky with new lines overlaying the first at different angles, the light edges of clouds being softened and finished with dry point lines. Parts of the distance are similarly treated, and then the middle distance and foreground are again and more perfectly gone over with the graver, and occasionally rebitten. Finally, the burnisher is brought into play alternately with the graver and point, to give the last finish to all parts.

It now remains to notice the laying in and finishing an historical subject, a matter involving more studied and laboriously careful execution than is required in landscape. The accessories are partly finished; next follows laying in with the graver, in lightly cut lines, the drapery, flesh, and all other parts not etched. The direction, character, degrees of width, and disposition of these lines demand careful study, as it is to their judicious variety and correct adaptation to form and texture that a line engraving owes the peculiar richness and power which constitutes its superiority over all other styles. In draperies the lines are generally disposed across the folds diagonally, and in curves accommodated to their risings and fallings; the *modelling* of the forms being indicated by the greater width of the lines; the heights, and by closer contact and involution of the curves in the depressions. In graving these lines regard must be had to the nature of the materials to be represented, although the various textures are only fully developed in finishing. In a well-fin-

¹ Proof, in the etched state, of plates executed by engravers of high repute are much prized by connoisseurs; but the proofs thus sought after are rarely taken in the crude condition of the first biting-in; they are more commonly proofs of a slightly advanced state, in which some rebiting, and a limited use of the graver and point, have been employed.

ished modern historical plate, nearly every substance has its own special character or disposition of lines. Rough woollen surfaces are represented by strong, long dot lines; smooth woollen draperies by continuous lines; velvet, silks, and metallic surfaces have lines similar in character, though varied in disposition and treatment. They are generally laid wide apart to receive an interline in the next. To realize the texture and tones of the human skin or flesh is the most difficult task of the engraver. This is best done by lines formed of long dots closely following each other in the dark parts, the distance between the dots increasing as the high lights are approached. Continuous cut lines give a metallic texture to flesh.

When all parts of the subject are laid in, the artist proceeds to finish the work by re-entering and thickening with the graver the lines forming the darker shadows of the drapery, and by cutting cross lines over those parts where the forms of the folds, the texture, or colour, render crossing desirable; the strength of the lines being occasionally helped by re-bitings. Cross lines should be laid over the first at such an angle as will make the spaces thus formed assume a blunt lozenge shape, and these spaces are filled, on occasion requires, with long or round dots. Velvet, satins, silks, and metals are generally brought up to their full strength of shading by laboriously patient cutting, to secure the necessary equality and smoothness. Flesh is finished by crossing, where needful, with dotted lines; the dots forming the crossing being confined to the spaces between the principal lines. The lines of dots are generally run through lightly with the graver in the shadows, to give them a softened continuity, but in the light parts they are connected by small irregular dots, which fill the spaces of the spaces formed by the crossings are filled with similar dots.

Fig. 1 in accompanying plate is an example of a figure in the etched state, showing, when compared, with the finished state in fig. 2, the relative amount of work in both, as generally practised in large plates.

An almost incredible amount of laborious and carefully minute graving is required in a highly-finished historical plate to bring out the proper effects of form, texture, relief, &c.: it is finished chiefly with the graver, burnishing and re-biting being much less available than in landscape. The concluding operation, in both landscape and historical plates, is termed *toning the plate*, which consists in a harmonious blending of the light and shade, by producing the half lights, reflections, and almost insensible gradations of tone, that are found not only in the shading, but in the different tints and colours of a picture, and which, though almost imperceptible to the unpractised eye, give the unity, breadth, and mellowness of effect essential to a highly-finished engraving; but many proofs and retouchings are necessary ere a satisfactory result is obtained.

Painters' or Amateur Etching.—This art is a favourite pursuit with amateurs; and as the formal regularity demanded in professional engraving is unnecessary, anyone possessing a mastery of the pen or pencil in drawing can, with a little practice, attain considerable proficiency in it. Laying the ground and biting-in are done as previously described, but as the aid of the roller press cannot always be obtained, recourse must be had to another mode of transferring the outline. Take a piece of a thin piece of paper with powdered red chalk, place the coloured side next the ground, and fasten the corners to the plate with bordering wax. The outline, made on tracing paper, is laid over all, face downwards; the pencilling seen through on the back is gone softly over with the point, and the subject thus reversed

on the plate. Very little pressure is the use of the graver and dry point sufficient for finishing this description of work. A specimen of the style is given in fig. 3.

Soft-ground Etching.—This is the most expeditious of all methods of engraving; the manipulation differs, but little from drawing in pencil or chalk. The ground, made by mixing lead with common etching ground, is laid on the plate and smoked as before, but its extreme softness renders it very liable to injury. The outline of the subject is drawn on a piece of rough paper larger than the plate. The paper is then damped, and laid gently over the ground face upwards, and the margins folded over, and pasted down on the back of the plate. When the paper is dry and tightly stretched, the bridge is laid across, and with a hardish pencil and firm pressure the drawing is completed in the usual manner. The pressure makes the ground adhere to the back of the paper at all parts touched by the pencil, and on the paper being lifted carefully off, these parts of the ground are lifted with it, and the corresponding parts of the plate thus left bare are exposed to the subsequent action of the acid. The granulated surface of the paper, causing similar granulations in the touches on the ground, gives the character of a chalk-drawing. The biting-in is effected in the same manner as already described, and the subject is finished by re-biting and dotting with the graver. A slight example of soft-ground etching will be found in fig. 4.

Engraving in Outline.—Outline is now invariably etched, but formerly the practice was to transfer it to a wax ground, and cut it entirely with the graver. The necessary relief is given by thickening the line on the shadow sides, but to preserve softness the thickening should consist of two or three lines laid close together. A further degree of roundness and form may be obtained by introducing a few light lines of shading; fig. 7 is a specimen of the manner.

Stipple, or Chalk Engraving.—In its pure state, is exclusively composed of dots, varying in size and form as the nature of the subject demands. Until the beginning of the nineteenth century this purity of style was generally preserved; but the mixture of lines then first admitted in back grounds gradually extended to draperies and other parts in increasing proportions, and—excluding representations of statuary—few stipple plates are now produced without a large admixture of line in all parts, flesh excepted. In addition to the instruments used in line-engraving, small toothed wheels, named *rouleaux*, are used for etching imitations of chalk-hatching.

The first steps in executing a plate in this style are precisely the same as in line engraving, the accessories and landscape parts being etched with lines. Draperies that are to be treated in pure stipple, and parts of the flesh, are sometimes etched with dots, a graver having a downward curve being now used as well as the point; but in the best works draperies and flesh are left entirely for the graver. When the etching is bit in and the ground removed, the line parts are forwarded, and then the draperies, &c., to be treated in mixed line and stipple, are laid in with the graver in lines, similarly disposed but with less variety of character than in line engraving. Dotted is next introduced between these lines with the graver, and then the flesh and other purely stipple parts not etched, are also dotted in and the whole gently re-bitten. The gradations of shading in the flesh and stippled parts are now produced by enlarging the dots with the graver, and making the irregularities of their forms fit into each other, and again giving a general re-bite. This process is repeated until the whole subject is brought to nearly the full strength, after



which the stippled parts receive a light interdotting to give solidity to the tone. The final process of toning is the same as in this engraving; but as re-biting and burnishing can be more effectively resorted to, high finish is obtained with less labour. Examining a stipple plate closely, the dots are found to be composed of several incisions, slightly apart in the lighter shades, and run together into large irregular shapes in the stronger darks. A great advance has been made in stipple engraving by the introduction of large and novel forms of dotting in the draperies. By this means an effect is produced rivaling line in richness and power. Fig. 8 is an example of pure stipple.

Aquatinta.—This method, as first practised and still followed on the Continent, has been already described (see *AQUATINTA*, vol. i. p. 217)—and it now only remains to notice the manner adopted by British artists.

Instead of depositing powdered resin and granulating it by the application of heat, an alcoholic solution of resin or mastic, in proportions of about one ounce of resin to a pint of alcohol, is used to form the ground. The outline of the subject is usually first etched, then the plate is cleansed, and laid in a slanting position in a shallow tin vessel. The solution is poured on the plate, its position being maintained till the superfluous fluid has nearly run off, when it is laid flat till what remains on the surface has settled and dried. The evaporation of the alcohol leaves the resin disposed equally over the plate in larger or smaller granulations according to the quantity of resin in the solution. The same acids are used in biting aquatinta. All the gradations of shading are sometimes got by one biting, but the ordinary practice is to use a second, or even a third ground of coarser quality for the darker shades. The *burning-ground*, mentioned in the previous notice, can be as effectively employed in this as in the dust-ground manner. Aquatinta grounds are so hard that the outline may be traced on them without injury, and etching avoided; but the aid of lines cannot wholly be dispensed with. A specimen of aquatinta is given in fig. 5.

Mezzotinto differs fundamentally from all other styles of engraving on copper or steel, inasmuch as in it the lights and gradations are scraped and burnished out of a prepared dark ground, whereas in other methods the shading is corroded or cut into a blank surface. The instruments used are—grounding cradles, scrapers, and burnishers of different forms. The *cradle* is axe-shaped, from 1 to 3 inches wide, fitted into a thick upright handle, one side of the blade having a row of close fine points on its curved edge. With the largest size of these instruments the first and peculiar part of the process, termed *grounding the plate*, is effected. This consists in covering its surface with minute incisions, by rocking the tool across it in all directions.¹ It is obvious that a plate so treated would, if printed,

¹ The operation of grounding is thus performed. A series of vertical lines are drawn on the plate at intervals equal to about one third the curved face of the cradle, which is then placed upright across the two first lines at one end, and with firm pressure, and a slow progressive motion, is rocked from side to side along the whole length in the direction of the lines, the teeth on the edge covering with small indentations the space travelled over. The like operation is repeated in all the remaining spaces. Another set of similar lines are next drawn across, at right angles to the first, and the cradle passed along and between them as before. Systems of diagonals are now drawn in rotation, crossing and recrossing each other, all of them being severally and successively operated upon with the cradle. This done, the plate has got what is termed *overturn*; but to obtain the intensely rich black of a fine mezzotinto, many such turns are necessary.

give a uniform black impression, and that scraping any part would cause a lighter shade; further, that were the same part burnished, a white spot on the impression would be the result. Keeping this in view, and bearing also in mind that no cutting or corroding is employed, the process and the effect produced will be readily understood.

While the ground is clean it presents a dull whitish surface, on which a black outline is clearly seen. A squared reducing is made on paper as formerly described, and the grounding on the plate made the exact size of the reducing. Divisions are then set off round the edge of the ground similar to those on the reducing to serve as points from which to draw pencil lines forming similar squares on the plate, and which are reproduced during progress. These squares being drawn, scraping may be commenced without further preparation if the subject is very simple, but if it be full of details, the outline must be traced on by interposing between a tracing of the reducing and the ground a piece of thin paper covered on one side with lamp-black, and going over the outline with a blunted point. The highest lights are now scraped out, and the artist, passing to those of the next degree, making out forms as he goes on, descends gradually to the darkest shades, for which he leaves the ground untouched. The outline and masses of shading being secured, a proof is taken, after which the grounding is cleaned, the squares reproduced, and the minuter forms and gradations of tone more perfectly obtained. These operations are repeated, and frequent partial reproduction of the squares resorted to till the last general toning is entered upon. Should any part be made too light, small cradles are used to restore shading. Pure mezzotinto is easily distinguished by the total absence of lines or dots. A small example of the manner will be found in fig. 6.

The *Mixed Style*, as already noticed, is based on mezzotinto, which, still forming the great mass of shading, is in this method combined with line and stipple in such proportions as the taste of the artist suggests. All the tools employed in other styles are required for this; the roulette being largely used in subordinate parts.

In executing a mixed plate, a general mode of procedure is first to etch and bite in the outline and details of form as if for stipple, and then to have the plate covered with a mezzotinto grounding, on which the same process is gone through as in pure mezzotinto. Next, a thick etching ground is laid, and all parts it is desirable to etch are freely treated with the point and roulette, the subject being afterwards finished by further scraping and burnishing. Some artists prefer, however, to commence with pure mezzotinto, adding line and stipple in limited proportions; but in large plates every means which will give richness of effect are adopted without regard to regularity of style or neatness of handling. The well-known print of Bolton Abbey in the Olden Time may be cited as a fine example of the mixed style.

It is proper to notice here, that, excepting in the initiatory steps, there is no regular order of procedure observed in executing a plate in any style of engraving; but the variations are not so important as to affect the general accuracy of the descriptions given.

The following are a few of the most celebrated engravers, with the dates of their births and deaths, so far as these have been recorded:—

Italian Engravers in Line.—Andrea Mantegna, 1481-1506; Marc Antonio Raimondi, b. 1487; Marco da Ravenna, b. 1496; Giovanni Volpato, b. 1788; Raphael Morghen, 1798-1886; Giuseppe Longhi, 1766-1831; Pietro Anderloni, b. 1784. Among the more recent Italian engravers of eminence are Toschi, Garavaglia, and Jesi.

German, Dutch, and Belgian Engravers in Line.—Albert Durer, 1471-1528; Cornelius Cort, 1598-78; Hendrik Goltzius, 1558-1617; Lucas Vorsterman, 1578-1667 (?); Cornelius Vischer, 1610-70; Gerard Edellinck, 1627-1707; Jacob Houbraken, 1698-1780; George Frederick Schmidt, 1712-78.

French Engravers in Line.—Anthony Masson, 1638-1700; Gerard Audran, 1640-1703; Drevet the elder, 1684-1789; Drevet the younger, 1697-1789; J. G. Wille, 1717-1807. Of modern French engravers, Dupont, Bridour, Forster, and François are in the first rank.

British Engravers in Line.—Wenceslaus Hollar, 1607-77; W. Faithorne the elder, 1620-91; David Loggan, b. 1630; George Vertue, 1684-1766; F. Vivares (landscape), 1712-82; John Brown (landscape), b. 1719; Sir R. Strange, 1731-93; W. Woollett, 1735-85; F. Bartolozzi, 1780-1803; John Hall, 1789-97; W. Sharp, 1749-1824. To these may be added the eminent names of John Burnet, George T. Doo, John Horsburgh, J. H. Robinson, J. H. Watt, and Lumb Stocks. The British landscape engravers of the nineteenth century excel all other. Amidst a great wealth of talent, the names of W. Miller, John Pye, W. E. Cook, E. Goodall, John Cousen, J. T. Willmore, R. Brandard, W. Forrest, and W. Richardson are pre-eminent.

Engravers in Stipple.—W. Wynne Ryland, b. 1782; R. Cooper, b. 1780; Henry Meyer, b. 1782. In the nineteenth century are—Meadows, H. Robinson, H. T. Ryall, William Holl, Francis Holl.

Engravers in Mezzotinto.—John Smith, d. 1720; John Raphael Smith, 1760-1812; Valentine Green, 1739-1818; Richard Earlom, 1748-1822; James Ward, 1801-46. Samuel Cousins, 1801-1887, may be called the most eminent mezzotinto engraver of the nineteenth century. French engravers in mezzotinto include Jazet, Girardet, and Girard.

In *Aquatinta*, the only noteworthy engraver is Paul Sandby, 1732-1808.

For full information of engravers and their works, see Bryan's Dictionary of Painters and Engravers, and Strutt's Biographical Dictionary of Engravers.

Engraving on Wood.—Impressions taken from a fine wood-cut and from a line-plate assimilate very closely in point of style, the shading of both being composed of lines. But while the impressions thus resemble each other, the engraving itself, as it appears on the plate and on the block, and the manner of printing, are widely different. In the plate the lines forming the shading are cut into the metal, and when printed are filled with ink, and the surface wiped clean; but in the wood block the spaces between the lines are cut out, leaving the lines standing up like type, and, like them, are printed by inking the surface. The wood best adapted for engraving is box. It is cut across the grain in thicknesses equal to the height of type, these slices being subjected to a lengthened process of seasoning, and then smoothed for use. Every wood engraving is the representative of a finished drawing previously made on the block; the unshaded parts being cut away, and the lines giving form, shading, texture, &c., produced in relief, by excavations of varied size and character, made between them by gravers of different forms. The ordinary method of drawing on wood is first to coat the block very thinly with white. The outline is then traced on, the masses of shading washed in with Indian-ink, and the parts detailed and finished with black-lead pencils. This manner leaves much of the ultimate success of the cut dependent upon the skill of the engraver; but another mode, denominated the facsimile style, in which all the shading is done in lines with the pencil alone, leaves nothing for him to do but to cut out the parts untouched by the pencil. The tools required for wood engraving are more numerous than those of the plate engraver. Besides the different lozenge-gravers for general use, tinting tools or *twist*-gravers are employed for cutting out the deep, narrow spaces between closely set lines, &c.; there are also small gouge and chisel shaped instruments used to scoop out the larger unshaded parts,

and to cut away the superfluous wood at the sides of the block. See WOOD ENGRAVING.

Die Sinking and Stamp Cutting.—These branches of engraving are sometimes combined; but the medalist, while he is, strictly speaking, a die-sinker, confines himself exclusively to his own high department of art. (See NUMISMATOLOGY.) Dies are made of the finest steel, and are usually conical in form, the apex being made the size and shape of the intended device. They are carefully softened by annealing before being engraved, and are hardened when finished. Engraved dies are used for striking up, by means of a screw-press, the devices on coins, medals, &c., and the raised ornaments on many of the decorated metal articles in common use. The tools employed in die-sinking are very similar in form and variety to those used in wood engraving; but sets of punches, engraved in relief and hardened, are used for the small details. In common ornamental dies the devices, often repeated, are formed almost entirely by punches. Great nicety of manipulation is demanded in die-engraving; the device is cut or hollowed out below the surface, the impressions struck from it being necessarily in relief, or standing above the surface. Should a serious error be made, the face of the die is filed down till the part is brought within possibility of correction, when the whole work must be gone over again.

Stamp-cutting includes, in its practice, the decorative tools used by the bookbinder, and metal stamps of all descriptions, in which the impression taken in ink, gold, &c., is made by the surface of the ornament, device, or letters cut in relief on them. The process of engraving metal stamps is precisely the same as that of engraving on wood; the parts intended to impress being left standing up in relief.

Engraving on Precious Stones; Seal or Gem Engraving.—The practice of this elegant art is essentially the same now as in those remote times which produced the much-prized engraved gems denominated *antiques*. The tools of the gem-engraver are small disk-shaped, spherical, and cylindrical instruments, varying in size from a mere point to $\frac{1}{4}$ inch in diameter; they are simply the ends of pieces of soft iron wire filed into the requisite shapes, the other end of the wire being embraced by a conically-shaped piece of lead. When the tool is used the leaden end is fitted into the perforated axis of a small grooved wheel placed within the rounded top of a small pillar, erected on the table at which the artist sits. A thin band of gutta-percha passes round the small wheel and a large wheel under the table, and the ordinary crank and treadle wrought by the foot, giving motion to the wheels, causes the tool to revolve rapidly. The first procedure of the engraver is to dim the surface of the stone with emery powder, and to draw on it the outline of his subject with a brass point. One of the small disk-shaped tools is then fitted into the machine, and, being set in motion, it is coated with diamond powder moistened with oil. The stone is now applied with gentle uniform pressure to the revolving tool, which, by virtue of the diamond powder incorporated with its surface, cuts or engraves the outline in shallow lines by a process of grinding. The forms and modelling of the device are then hollowed out with the rounded tools, impressions being taken at intervals with softened bees'-wax to ascertain progress. The same means are sometimes used for cutting devices for seals on metal, by substituting steel tools, roughened like files, and hardened. See GEM SCULPTURE.

ENGROSSING, in law, denotes extending a deed, or re-writing it out fully in fair and legible characters; also, buying up large quantities of corn or other produce, to enhance the price (see next article).

ENGROSSING, FORESTALLING, and REGRATING, are terms in law which describe the purchase of the whole or of such quantities of articles in a market as shall raise the price. To prevent this crime against the community statutes were passed in 1286-87 (51 Henry III. st. 6, sec. 3), in 1350-52 (25 Edward III. st. 4, cap. iii.), in 1552 (Edward VI. act 6, cap. xiv.), in 1562 (Elizabeth, act 5, cap. iv. sec. 18), and in 1570 (Elizabeth, act 13, cap. xxv. sec. 5).¹ These restrictions were not entirely confined to the trade in corn, although it was always one of their chief objects. The offence of *engrossing* was described by the statute of Edward III. as the 'getting into one's possession, or buying up large quantities of corn, or other dead victuals, with intent to sell them again;' *forestalling* as the 'buying or contracting for any cattle, merchandise, or victual, coming in the way to the market, or dissuading persons from bringing their goods or provisions there, or persuading them to enhance the price when there;' and *regrating*, 'the buying of corn or other dead victual in any market and selling it again in the same market, or within 4 miles of the place.' By the statute of Edward VI. the engrossing of corn, which included the buying of it in one market to sell it in another, was made punishable by imprisonment and pillory; and no one could carry corn from one part of the kingdom to another without a licence. The granting of this licence was confided, in the reign of Elizabeth, to the quarter-sessions. The existence of such statutes could not fail to operate upon the common law, and when, after various modifications, passed at different times, especially in 1624 and 1668, all the positive statutes against these offences were repealed by the act 12 George III. cap. lxxi., passed in 1772, they were still found to be punishable by common law. Accordingly, by act 7 and 8 Victoria, cap. xxiv., passed 4th July, 1844, the offences of engrossing, forestalling, and regrating, with some similar ones, were abolished throughout England, Scotland, and Ireland; and no prosecution is now allowed on account of them, either at common law or in virtue of any statute. The Scottish laws against engrossing, forestalling, and regrating are much later than the English statutes, from which they were probably borrowed. They appear to have rested chiefly on act of 1592; and before their direct repeal by the above statute they had already long fallen into desuetude.

ENHARMONIC, in music, is an epithet applied to intervals smaller than the regular divisions of the scale. The interval, for example, between C sharp and D flat (which on tempered instruments are played on one note) is called an enharmonic interval. The ancients had a mode of music which they called enharmonic, but it is not agreed among critics to what mode of progression they applied the term.

ENIGMA. See **ÆNIGMA.**

ENKHUIZEN (Latin, *Enchuse*), a town, Holland, on a projection in the Zuider Zee, 29 miles north east of Amsterdam. It is regularly built, nearly in the form of a circle, has several handsome edifices, and was once a place of great importance, with a chamber of the East India Company, numerous commercial establishments, and a population of 40,000, now reduced to (1899), 7038.

ENLISTMENT. There are two modes by which the standing forces, military or naval, of a state may be maintained; either by forced conscription or by voluntary enlistment. The former method is adopted in most military countries, including the majority of European states; the latter is found preferable in countries like Britain in which the mercantile spirit prevails. We have already described the former (see **CONSCRIPTION**); it is of the latter alone we have here

to treat. The English laws in regard to enlistment deal with two subjects, the enlistment of forces by the government of the country for the service of the state, and the attempts of foreign powers or their agents to enlist British subjects for foreign service.

Up till the year 1802 the enlistment of men for the British army was left in the hands of private undertakers, or middlemen, who received a commission on the recruits they procured, but the abuses of this system now induced the government to take the matter under their own management. At an early period enlistment was for short periods, but this was soon changed to enlistment for life. No greater mistake could have been committed. To compete for their soldiers in the open market with the farmer, the tradesman, and every other private hirer of labour, was a sufficient disadvantage to a government which had to cope with armies raised by conscription, but to put unnecessary restrictions upon enlistment and make its service almost penal was at once to limit itself for recruits to the dregs of society. Even conscription did not extend beyond a limited series of years. It is usually long, however, before such plain matters become understood, and even the act of 1847 was only a slow step in the right direction. This act (10 and 11 Victoria, cap. xxxvii.) limited the term of enlistment to ten years for the infantry, and twelve for the cavalry, artillery, and ordnance; re-enlistments for periods of eleven and twelve years might be made within six months before the period of the first term, or within three years if engaged in foreign service, the commanding officer might likewise prolong the period of service of a soldier on foreign service for two years after his term had expired. A retiring pension was allowed only for serving the full time after re-enlistment. A partial change in the term of enlistment was made during the Crimean war, and further changes were made by the Army Enlistment Acts of 1870 and 1881. According to the act of 1870 all enlistments are for general service and not for any particular regiment, and the system of long and short service was then introduced. By both acts the term of long service was fixed for twelve years, at the expiry of which period the soldier may re-enlist for other nine years, service for the two terms or twenty-one years entitling him to a pension. The short service of the first act extended over six years with the regular army and six years in the first class reserve, the short service of the act of 1881 is seven years in the regular army and five in the reserve. For the present it is intended that all enlistments should be for short service except in the household cavalry and one or two other special corps. For further details of the present system see under **ARMY**. Before a recruit is fully admitted into the army he has to sign a declaration and take the oath of enlistment as prescribed. He does not now receive the proverbial shilling when enlisted. Up till the act of 1870 a bounty was given to recruits to induce them to enlist. This improper bribe was abolished by this act.

The navy requiring a service of skilled men, it was long deemed that voluntary enlistment would not suffice to recruit it, and a system of impressment, not from among the general population, but from the seafaring portion of it, was systematically used in recruiting for the navy. Had this impressment been regularly organized on a system of conscription, it would at least have been impartial and not more oppressive than the service of the country might have been supposed to require. But the impressment was arbitrary, conducted by press-gangs, who forcibly seized the first likely seaman they could find. This barbarous mode of recruitments was recognized by many statutes from the time of Richard II. to that

¹ Woodward and Oates.

of George III., which still stand unrepealed; but after the peace of 1815 the mode of recruiting by bounties was substituted for it. As late as 1847, however, it was enacted that seamen whose qualifications entitled them on enlistment to double bounty should be formed into a class, and that government might by a proclamation prohibit shipowners from hiring persons of this class! At present the seamen of the navy are a body of men who have entered the service as boys, and have been trained up for their special career. Under existing regulations seamen engage for a first period of twelve years, and they may then engage for a second period of other ten years. After serving for the twenty-two years a seaman is entitled to a pension. He may even engage for a third period of five years. Besides seamen a modern ship's company consists of engineers and a number of engine-room artificers and stokers. See NAVAL RESERVE.

ENNIS, a town of Ireland, county Clare, on the Fergus, 19 miles north-west of Limerick. It is irregularly built, the streets being narrow and crooked, but contains many neat detached houses. A considerable trade in grain, flour, and agricultural produce is carried on, and large fairs and markets are held. Previous to 1885 it returned one member to Parliament. Pop. in 1891, 5460.

ENNISCORTHY, a town of Ireland, county of Wexford, situated on the river Slaney, 77 miles s. of Dublin. There is an old castle erected by one of the early Norman conquerors, and in the neighbourhood is Vinegar Hill, the scene of a skirmish in 1798 when the town was stormed by the rebels. The river Slaney is navigable, and there is a considerable trade in provisions. Pop. (1891), 5648.

ENNISKILLEN, a market town of Ireland, county Fermanagh, 84 miles n.e. of Sligo, on an island in the river which connects the upper and lower sections of Lough Erne, with suburbs on both sides of the adjoining mainland, with which it communicates by two bridges. The manufacture of shirts and collars, brewing, &c., are carried on, and the trade is considerable. Previous to 1885 Enniskillen returned a member to the House of Commons. Pop. in 1891, 5570.

ENNIUS, **QUINTUS**, an early Latin poet, considered by the Romans as the father of their literature, was born at Rudiae, near Brundisium, 239 B.C. In early life he is supposed to have served as a soldier. When he was about thirty-eight years of age Cato the Censor brought him to Rome, where he soon gained the friendship of the most distinguished men, and instructed the young men of rank in Greek. With an extensive knowledge of the Greek language and literature he united a thorough acquaintance with the Oscan and Latin tongues, and exerted great influence on the last. He died at about seventy years of age. He wrote an epic, *Scipio*, in hexameters; *Roman annals*; tragedies and comedies; satires, epigrams, precepts, &c. His whole works are supposed to have been extant up to the thirteenth century, but nothing now remains but fragments given as quotations in other ancient authors, many of them mere citations by grammarians and other insignificant extracts. A few larger fragments have been preserved, which give a favourable impression of his genius. His success in his own day was great. His poems were for a long period read aloud to admiring multitudes, and they were often quoted and referred to by the great writers of antiquity. See Sellar's *Roman Poets of the Republic*.

ENNS, a river in Austria, which rises on the north slope of a branch of the Noric Alps, in Salzburg, about 12 miles south of Radstadt, flows nearly due north to that village, then n.e. across the north

part of Styria, then circuitously n.w. into the Archduchy of Austria, separating and giving name to the two great divisions of Austria above and Austria below the Enns, or Upper and Lower Austria, and finally enters the Danube on the right bank a little below the town of Enns. Total course about 160 miles. In the lower part of its course it becomes navigable.

ENOCH, one of the patriarchs who lived before the deluge. He became the father of Methuselah at the age of sixty-five years; and we are told that he 'walked with God', and at the age of 365 years 'God took him'. The words quoted are generally understood to mean that Enoch did not die a natural death, but was removed as Elijah was. The book of Hebrews (xi. 5) confirms this view.

ENOCH, **BOOK OF**, an ancient apocalyptic work in the Ethiopic language, of an assumedly prophetic character, of considerable importance on various accounts, and particularly because of its quotation by St. Jude in the 14th and 15th verses of his epistle. The book of Enoch is referred to by many of the early fathers. Tertullian believed it to be canonic. Justin, Irenæus, Clement of Alexandria, Origen, and Augustine, all appear to have been acquainted with it. Latterly it became discredited, and finally was lost to the Western Church, being known in Europe only by the references of these and other early writers. Bruce, the celebrated traveller, in 1773, discovered two Ethiopic manuscripts of it in Abyssinia, where it was still extant, and brought them home with him. Other manuscripts were subsequently found, and it has since been repeatedly translated and criticised in Europe, the Ethiopic text having also been published. The best translation (with commentary) is that of Prof. Charles: *The Book of Enoch* (1893). According to him 'The Book of Enoch as translated into Ethiopic belongs to the last two centuries B.C. All the writers of the New Testament were familiar with it, and were more or less influenced by it in thought or diction.' The Ethiopic version was translated from the Greek, but the original was in Hebrew or Aramaic. The Book of Enoch consists of revelations supposed to have been made to Enoch and Noah. The revelations refer to the state of future blessedness, of judgments upon the wicked, and of the coming of the Messiah. They are full of elaborate imagery founded on the Book of Daniel and other portions of the Old Testament, upon which the dogmatical teaching of the Book of Enoch is also founded. Prof. Charles regards it as having been based on five separate treatises, which were fused together and modified in various ways, the final editor having made use of a lost apocalypse, called the Book of Noah. See the *Encyclopædia Biblica*, vol. i. (1899).

ENOS, a maritime town of European Turkey, on the north coast of the Ægean, on a point of land projecting into the small estuary of the river Maritza, which opens into the Gulf of Enos, 70 miles south by west of Adrianople. It has a shallow harbour, but carries on a considerable traffic. Pop. 7000.

ENSIGN, formerly the officer who carried the flag or colours of an infantry regiment in the British army; for this title, 2nd lieutenant has been substituted. In naval language the ensign is some kind of distinctive flag. See FLAG, UNION FLAG.

ENSILAGE (from Spanish *ensilar*, to store in a pit or silo, from *L. silus*, a pit), a method of preserving green fodder in a close pit (silo), or a building constructed for the purpose, under pressure. The storage of grain and fodder in underground vaults was not uncommon among the ancient Greeks and Romans, and is still extensively practised in

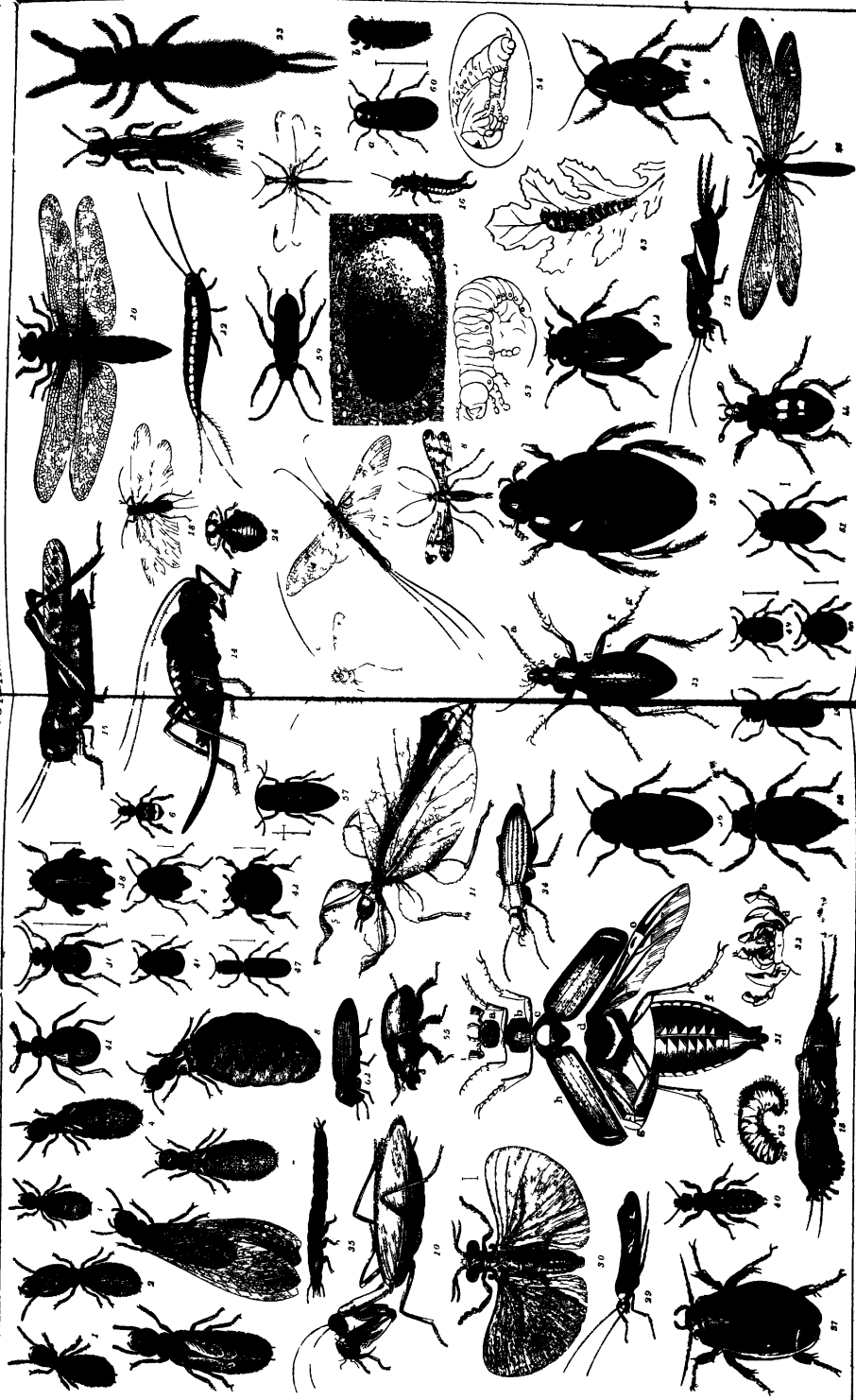


Fig. 1. *Periplaneta*. 2. *Blattella*. 3. *Leucophaea*. 4. *Blattella*. 5. *Blattella*. 6. *Blattella*. 7. *Blattella*. 8. *Blattella*. 9. *Blattella*. 10. *Blattella*. 11. *Blattella*. 12. *Blattella*. 13. *Blattella*. 14. *Blattella*. 15. *Blattella*. 16. *Blattella*. 17. *Blattella*. 18. *Blattella*. 19. *Blattella*. 20. *Blattella*. 21. *Blattella*. 22. *Blattella*. 23. *Blattella*. 24. *Blattella*. 25. *Blattella*. 26. *Blattella*. 27. *Blattella*. 28. *Blattella*. 29. *Blattella*. 30. *Blattella*. 31. *Blattella*. 32. *Blattella*. 33. *Blattella*. 34. *Blattella*. 35. *Blattella*. 36. *Blattella*. 37. *Blattella*. 38. *Blattella*. 39. *Blattella*. 40. *Blattella*. 41. *Blattella*. 42. *Blattella*. 43. *Blattella*. 44. *Blattella*. 45. *Blattella*. 46. *Blattella*. 47. *Blattella*. 48. *Blattella*. 49. *Blattella*. 50. *Blattella*. 51. *Blattella*. 52. *Blattella*. 53. *Blattella*. 54. *Blattella*. 55. *Blattella*. 56. *Blattella*. 57. *Blattella*. 58. *Blattella*. 59. *Blattella*. 60. *Blattella*.

many parts of Asia and Africa; but it was not till within recent years that ensilage proper became an important factor in agricultural economy. The system may be said to have been brought prominently before the notice of the farmers of Britain and America in 1879, when there appeared the English translation of a work on this subject by M. Goffart, a French farmer. Before the close of that year the system got a fair trial on hundreds of farms on both sides of the Atlantic, and since then it may be said to have given general satisfaction. All kinds of green fodder may be preserved, as maize, oats, rye, buck-wheat, vetches, lucerne, grass, clover, tares, &c., and in all cases the food thus treated has been eagerly consumed by cattle. The silos may be mere pits dug in the ground, but the best are regularly built, having walls of stone, brick, or concrete, with a facing of cement, the floor being paved, and the surrounding soil well drained. In size a silo may be 50 feet long, 12 feet broad, and 16 to 20 feet deep. The top covering of the ensiled material should be beams or boards weighted to the extent of 70 lbs. to the square foot with stones, bricks, bags of earth, or cast-iron weights; as the silage gets consolidated, the covering of course sinks. A silo should not be filled too rapidly; a layer of 20 inches a day is all that should be attempted. Fodder should be cut and stored when in its bloom, and may be packed in wet weather without deteriorating its quality. Sometimes a little salt is added. Good ensilage is now often made in stacks, without any silo being used. By deferring the application of pressure for a few days after the silo is filled the fodder may be kept sweet, otherwise it forms sour ensilage.

ENTABLATURE, in classical architecture, the horizontal, continuous work which rests upon a row of columns. See **ARCHITECTURE**.

ENTAIL, the settlement of an estate so that it shall pass according to a certain rule of descent; an estate settled with regard to the rule of its descent; commonly the limitation of landed property to a person and the heirs of his body. In England after the Norman Conquest estates were frequently granted to a man and the heirs of his body, but in time the law courts interpreted such grants as conferring a fee simple conditional, so that when the condition, namely the begetting of an heir, was fulfilled, the estate became a fee simple absolute and could be alienated by the grantee. The Statute *De Donis Conditionalibus*, passed in 1285, declared that this interpretation was contrary to the intention of the grantors, and enacted that in all future grants of this nature the grantee should have no power to alienate the estate, and that on the failure of issue the land should revert to the grantor. The effect of this statute was to prevent the free conveyance of land, but gradually the lawyers created a series of proceedings, known as *fincs* and *recoveries*, by means of which a tenant in possession could bar the entail and convert his estate-tail into a fee simple, that is, into his absolute property. (See **FEU, ESTATE**.) These remedies created by the courts were abolished by the Fines and Recoveries Act, passed in 1833, and a direct means of barring entails was introduced. This statute enacts that every actual tenant-in-tail shall have full power to dispose of, for an estate in fee simple absolute, or for any less estate, the lands entailed, but a tenant-in-tail in remainder, expectant on an estate of freehold, cannot bar the entail, though he may bar his own issue, without the consent of the 'protector of the settlement', who is usually the tenant for life. An estate may be granted in tail general, or in tail special, being in the latter case restricted to heirs by a particular

wife. It may be limited to male heirs of the body (in tail male), or to female heirs (in tail female). An estate-tail is liable to every kind of debt. The tenant in possession may commit all kinds of waste upon it, and may grant leases for twenty-one years under the Settled Estates Act. In Scotland there is a statute known as the Entail Act, passed in 1885, which makes it lawful to tailzie or entail estates, that is, to substitute an arbitrary course of succession for the ordinary legal one. This act also gave power to condition the entail with prohibitory, irritant, and resolutive clauses, preventing the heirs from selling the lands, subjecting them to debts, &c. The course of subsequent legislation has been continuously in the direction of giving greater freedom to the tenant in possession of an entailed estate, and among the most noteworthy acts in this connection are the Montgomery Act (1770), the Aberdeen Act (1824), the Rosebery Act (1836), the Rutherford Act (1848), and acts passed in 1853, 1868, 1875, 1878, and 1882. The tenant in possession of an entailed estate in Scotland may now disentail by adopting certain specified proceedings, the interest of heirs of entail being duly protected.

ENTERIC FEVER. See **TYPHOID**.

ENTERITIS (from Greek *enteron*, an intestine), inflammation of the intestines. It is known by the presence of fever, fixed pain in the abdomen, costiveness, and vomiting. The causes are acrid substances, indurated feces, long-continued and obstinate costiveness, spasmodic colic, and a strangulation of any part of the intestinal canal, but another very general cause is the application of cold to the lower extremities, or to the belly itself. It comes on with an acute pain, extending in general over the whole of the abdomen, but more especially round the navel, accompanied with eructations, sickness at the stomach, a vomiting of bilious matter, thirst, heat, great anxiety, and a quick and hard small pulse. After a short time the pain becomes more severe, the bowels seem drawn together by a kind of spasm, the whole region of the abdomen is highly painful to the touch, and seems drawn together in lumpy contractions; and the urine is voided with great difficulty and pain. Costiveness may be a marked symptom, but more often diarrhoea occurs, and the more constantly, if the lower part of the bowel is the part attacked. The inflammation, continuing to proceed with violence, terminates at last in gangrene; or, abating gradually, it goes off by resolution. Enteritis is always attended with considerable danger, as it often terminates in gangrene in the space of a few hours from its commencement. Some forms of enteritis are common in children, and specially prevail during the teething period, and in hot weather in moist climates, being often due to improper feeding. The disease may, however, occur at any age from exposure to cold. Enteritis, more or less severe, is an occurrence in all cases of irritant poisoning, in which the chief symptoms are the vomiting, purging, pain, and prostration. The patient should be kept strictly quiet in bed. Usually it is well to clear out the bowel with a gentle aperient. The dieting is a matter of prime importance. Milk, deprived of its cream, with soda water, will probably be borne well; sips of iced water, barley water are bland and soothing, and small quantities of bland foods, such as well-prepared arrowroot, are valuable. The abdomen should be covered with large fomentations, or large mustard poultices may be used. In adults opium is one of the most valuable remedies, given with the carbonate of bismuth.

ENTOMOLOGY. The Greek word, *entoma*, from *en*, in, and *temein*, to cut, was applied by Aristotle to the articulated animals generally, and its Latin

translation, *insecta*, had the same wide meaning, being used for all animals with notched or insected bodies, the transverse division or segmentation of the body being the most conspicuous feature of these animals. But entomology and *insecta* have both undergone restriction, and the true insects which now form the province of the entomologist are those articulated or arthropod animals which have the head, thorax, and abdomen distinct; which have one pair of antennæ, three pairs of thoracic, and no abdominal limbs, in which respiration is aerial, and is effected (when special organs exist) by tracheæ or involutions of the integument, forming a tubular network through the body; in the majority two pairs of wings are borne by the thorax. The definition here given was outlined by Latreille, *Histoire Naturelle des Crustacés et des Insectes* (Paris, 1802-4), and the Crustaceans, Myriapoda, and Spiders now form distinct classes; while the Chitons, whose shells, made up of separate pieces succeeding each other from before backwards, conformed to the earlier arbitrary definition, are restored to the molluscs, with which class their anatomy and history identify them. Reserving for the article INSECTS what requires to be said of the affinities of the class, it may be useful here to indicate the relative importance of the groups illustrated on the adjoining plates. Insects are divisible into two groups, Mandibulate and Haustellate: the oral apparatus of the former being adapted for mastication, that of the latter for the imbibition of liquid food. The orders of insects are arranged under these heads as follows:—

- | | | |
|-----------------|----------------------|------------------|
| A.—MANDIBULATE. | Order 1.—Coleoptera | 2.—Orthoptera. |
| 3.—Neuroptera | 4.—Strepsiptera | 5.—Hymenoptera. |
| B.—HAUSTELLATE. | Order 6.—Aphaniptera | 7.—Aptera |
| 8.—Hemiptera. | 9.—Diptera. | 10.—Lepidoptera. |

The *Coleoptera* or Beetles are a very natural group, of which the most characteristic feature, that to which they owe their name, is the firm sheath which the first pair of wings form for the protection of the second pair, the outer cases being in some genera firmly united to each other, and the second pair functionally useless. The antennæ vary in form, being very short in *Bostrychus*, shown in plate II., fig. 17, while their great length, as in the goat-beetle, fig. 19, is characteristic of a large family, the Longicorns; the Lamellicorns have the last joints of their antennæ elongated on one side into a series of broader or narrower plates, like the leaves of a book, as in the boring-beetle, fig. 1, and the cockchafer. The Clavicorns, or those whose antennæ end, club-like, in an enlarged extremity, are illustrated by the weevils, fig. 14. The number of joints in the tarsus is also a basis of arrangement, the Pentamera, Trimer, and Heteromera corresponding to groups in which the numbers are, five, or three in all, or different in different limbs. The oral appendages are of great interest: the mandibles and both pairs of maxillæ are hard and useful in cutting, and are so throughout life, the habits of the larvæ being the same as those of the adult. The larvæ, figs. 3, 5, in passing to the imago or adult form, undergo slight change, and the sheath of the pupa, in place of forming a simple investment, as in the butterfly, fig. 48, incloses each limb in a separate investment. The beetles have the simplest life history, the change from larvæ to adult being so slight. Order 2. The *Orthoptera* and *Neuroptera* are not well defined from each other, the dragon-fly (see plate I., fig. 20) and the ant-lion (fig. 28) showing the imperfect distinction of appearance. The figs. 1-24 illustrate the present limits of the *Orthoptera*, at least as accepted by a large number of writers. The Termites, figs. 1-8, show those remarkable variations within the limits of one species which

correspond to the wonderful social instincts of the genus. The cockroach, fig. 9, and the earwig (*Forficula*), fig. 16, are examples of resemblance to the beetle, in that the anterior wings are firmer and more sheath-like than in the Termites; while all the genera show that the possession of wings, whether or not a sexual character, has very direct reference to function; the worker, fig. 1, and the soldier, fig. 2, not needing them; hence the view suggested that the wings are a late acquisition in the evolution of insects, the worm-like young of which being alike in so many orders, may perhaps represent the ancestral condition. The locust, fig. 15, and grasshopper, fig. 14, contrast in many ways, the latter insect showing a very remarkable modification of the last wings of the abdomen into the sword-like ovipositor seen in the fig. Figs. 21-14 refer to anomalous forms, whose position is uncertain. The supporters of the hypothesis above mentioned regard them, especially the *Thysanura*, fig. 23, as indicating the primitive condition of the class. The Dragon-flies and the *Ephemera*, fig. 19, are interesting, on account of the aquatic life of their larvæ, whose history will be found under EPHMERIDÆ. Order 3. *Neuroptera*. The May-fly, fig. 29; the scorpion-fly (*Panorpa*), fig. 28, the ant-lion (*Myrmaleo*), figs. 25, 26, represent this order, in which, as in the preceding, the oral apparatus is intended for mastication; the wings never tend towards the coleopterous type. The development is accompanied by complete metamorphosis. The caddis-worms are the larvæ of the May-fly, which leave the water to attain maturity. Fig. 25 shows the pit dug by the larvæ of the ant-lion, which lies at the bottom on the watch for insects that may tumble down the loose slopes. Order 4. *Strepsiptera*. *Xenos*, fig. 30, is one member of this small group, the short-lived males of which are winged, the females worm-like, parasitic. The larvæ gain admission to the bodies of hymenopterous larvæ, with whose development they keep pace, their final change coinciding with the death of their host. Order 5. *Hymenoptera*. The membranous wings of this order are all equally fitted for flight, and during rest are placed horizontally; see plate II., figs. 23-45. In the bee, the type of the order, the maxillæ, fig. 23, are elongated so as to form a kind of sheath round the still longer under-lip, which serves as a suctorial tube, and which, when not used, is folded up like a clasp-knife under the head; the mandibles retain their cutting form. The order is therefore transitional to the haustellate. Again, as in the *Orthoptera*, there is a wonderful history of social organization among bees, wasps, and ants; and with the division of labour, physical differences in the labourers coincide. Males and females are recognizable; workers, soldiers, slaves, are found in the communities. Again, the presence or absence of wings corresponds more to function than to sex. Order 6. The *Aphaniptera*, or fleas, are often referred to the order *Diptera*. Their wings are rudimentary, appearing as lateral scales. The proboscis is formed of the lower lip, and is open in front, the mandibles forming a boring instrument with serrated margins. Order 7. The *Aptera*, or lice, entirely want wings, and the thorax is both indistinctly segmented and imperfectly marked off from the abdomen. The oral appendages are irrecognizable; the whole being transformed into a fleshy protrusible tube, within which four fine rods combine to form a tubular stilet. The almost larval condition of the body brings them very near to the parasitic members of the next order. Order 8. *Hemiptera*. The proboscis is derived from the lower lip, the mandibles and maxillæ being reduced to the condition of setose organs. In many respects the order resembles that of *Orthoptera*, the anterior wings being either firmer than the posterior, or the thick-

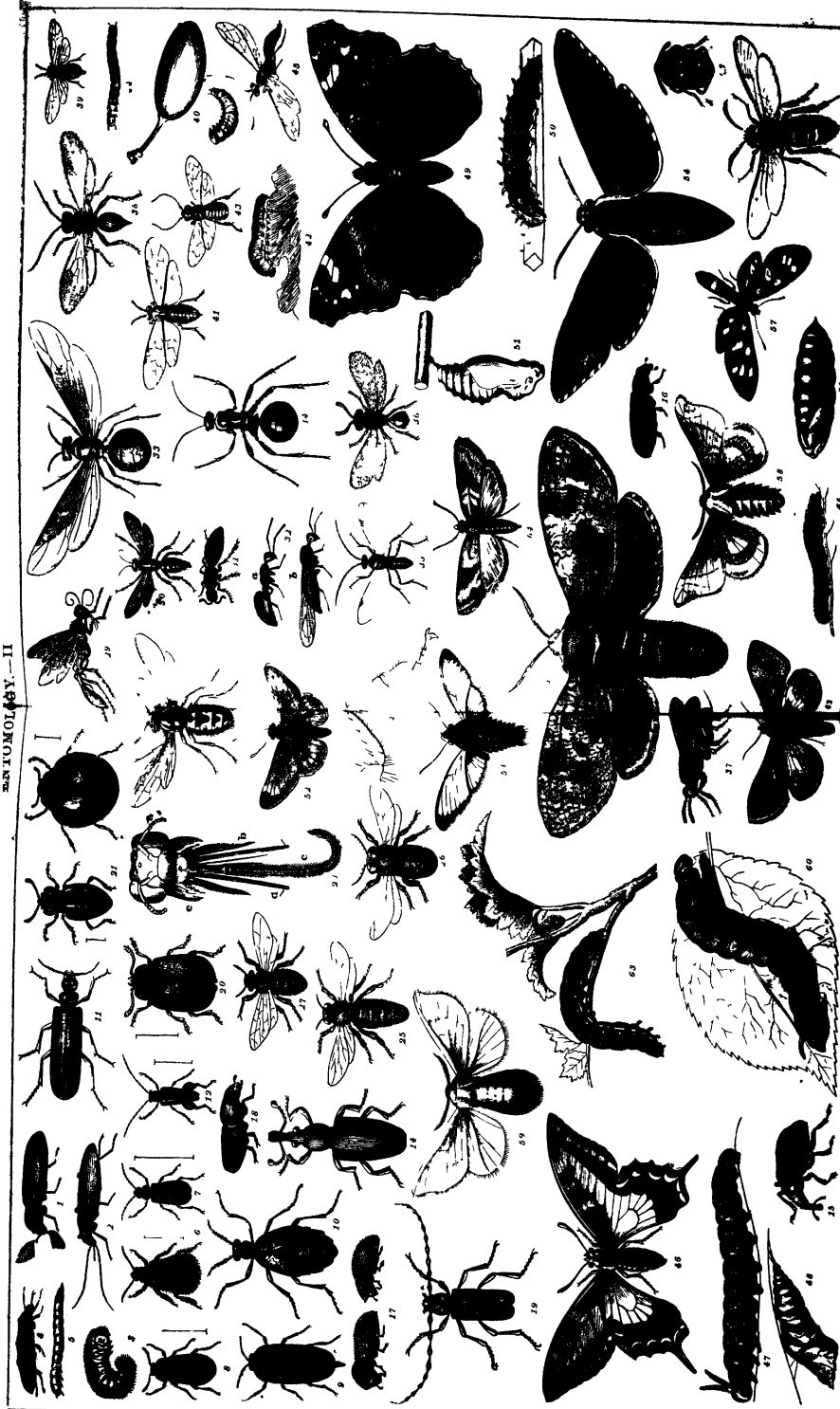
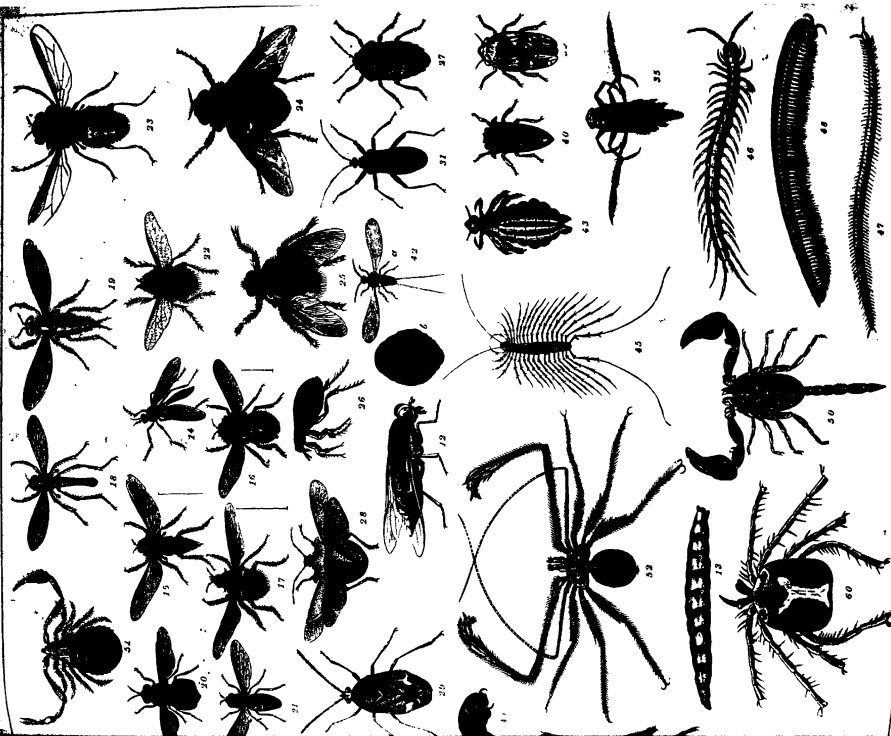
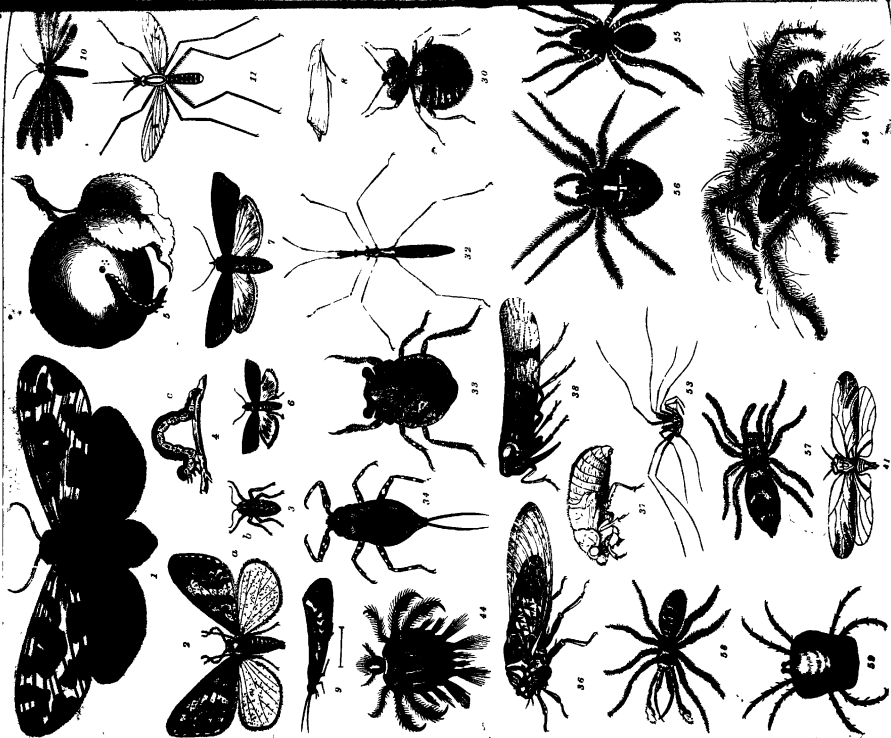


Fig. 1. *Phaenocarpa* (Hymenoptera). 2. *Phaenocarpa* (Hymenoptera). 3. *Phaenocarpa* (Hymenoptera). 4. *Phaenocarpa* (Hymenoptera). 5. *Phaenocarpa* (Hymenoptera). 6. *Phaenocarpa* (Hymenoptera). 7. *Phaenocarpa* (Hymenoptera). 8. *Phaenocarpa* (Hymenoptera). 9. *Phaenocarpa* (Hymenoptera). 10. *Phaenocarpa* (Hymenoptera). 11. *Phaenocarpa* (Hymenoptera). 12. *Phaenocarpa* (Hymenoptera). 13. *Phaenocarpa* (Hymenoptera). 14. *Phaenocarpa* (Hymenoptera). 15. *Phaenocarpa* (Hymenoptera). 16. *Phaenocarpa* (Hymenoptera). 17. *Phaenocarpa* (Hymenoptera). 18. *Phaenocarpa* (Hymenoptera). 19. *Phaenocarpa* (Hymenoptera). 20. *Phaenocarpa* (Hymenoptera). 21. *Phaenocarpa* (Hymenoptera). 22. *Phaenocarpa* (Hymenoptera). 23. *Phaenocarpa* (Hymenoptera). 24. *Phaenocarpa* (Hymenoptera). 25. *Phaenocarpa* (Hymenoptera). 26. *Phaenocarpa* (Hymenoptera). 27. *Phaenocarpa* (Hymenoptera). 28. *Phaenocarpa* (Hymenoptera). 29. *Phaenocarpa* (Hymenoptera). 30. *Phaenocarpa* (Hymenoptera). 31. *Phaenocarpa* (Hymenoptera). 32. *Phaenocarpa* (Hymenoptera). 33. *Phaenocarpa* (Hymenoptera). 34. *Phaenocarpa* (Hymenoptera). 35. *Phaenocarpa* (Hymenoptera). 36. *Phaenocarpa* (Hymenoptera). 37. *Phaenocarpa* (Hymenoptera). 38. *Phaenocarpa* (Hymenoptera). 39. *Phaenocarpa* (Hymenoptera). 40. *Phaenocarpa* (Hymenoptera). 41. *Phaenocarpa* (Hymenoptera). 42. *Phaenocarpa* (Hymenoptera). 43. *Phaenocarpa* (Hymenoptera). 44. *Phaenocarpa* (Hymenoptera). 45. *Phaenocarpa* (Hymenoptera). 46. *Phaenocarpa* (Hymenoptera). 47. *Phaenocarpa* (Hymenoptera). 48. *Phaenocarpa* (Hymenoptera). 49. *Phaenocarpa* (Hymenoptera). 50. *Phaenocarpa* (Hymenoptera). 51. *Phaenocarpa* (Hymenoptera). 52. *Phaenocarpa* (Hymenoptera). 53. *Phaenocarpa* (Hymenoptera). 54. *Phaenocarpa* (Hymenoptera). 55. *Phaenocarpa* (Hymenoptera). 56. *Phaenocarpa* (Hymenoptera). 57. *Phaenocarpa* (Hymenoptera). 58. *Phaenocarpa* (Hymenoptera). 59. *Phaenocarpa* (Hymenoptera). 60. *Phaenocarpa* (Hymenoptera). 61. *Phaenocarpa* (Hymenoptera). 62. *Phaenocarpa* (Hymenoptera). 63. *Phaenocarpa* (Hymenoptera).



leg. confined to the proximal half. Again, there is great modification of the limbs for running, springing, and the like; while the development is incomplete, the larva resembling the adult. The *Heteroptera* have the wings, when at rest, horizontal, and the sheath-like modification of the anterior pair is confined to the section which is illustrated in fig. 27-35 of our third plate. The *Homoptera* have the wings aloped when at rest: fig. 36, Cicada, and 39, the insect of the familiar cuckoo-spit. Both wings are membranous. Besides the large family of Cicadas, the *Homoptera* include the plant-lice, mealy bugs, and scaly bugs, as the cochineal insect, fig. 42. The wingless neuters of the plant-lice, which bring forth living and mature progeny to the extent of millions in a season, give the grandest example of a sexual reproduction in the class of insects. Order 9. *Diptera*. The house-fly, with its single pair of membranous wings, the posterior pair being converted into poisers, *halteres*, such as are seen in fig. 18, is a good example of an order which, as here restricted, is a natural one. The metamorphoses of the *Diptera* are also familiar, the maggot of the flesh-fly, a limbless worm, with suctional mouth, departing from the ordinary type of larvæ, which have three pairs of limbs and masticatory jaws. The proboscis of the adult is derived from the upper and lower lips, the mandibles and maxillæ taking no share in it. While some of these *Diptera* are harmless scavengers, like the house-fly, others, as the breeze-fly, figs. 12, 13; *Tachina*, fig. 22; bot-fly, fig. 23, are injurious to other animals. The sting is irritating, and causes fever in man and beast; and this, as well as the pertinacity with which the eggs are laid on raw surfaces of living bodies, form insuperable obstacles to the maintenance of certain animals in some regions; thus in Eastern and South Africa the camels, horses, and domestic cattle are victims of a dipterous insect; while the colts in Paraguay die of the larvæ which hatch out of eggs deposited on the navel. Order 10. *Lepidoptera*. The butterflies, or diurnal, and the moths, or the chiefly nocturnal members of this group have a long proboscis, which is, when not in use, coiled up under the head; the maxillæ form the two halves of this organ, whose parts are therefore at right angles to that of *Diptera*. The mandibles and lips take no part in its formation. The high specialization of the organ throughout the order, coupled with the complete metamorphosis (the larva, with masticatory jaws, showing, moreover, in the false feet of the abdomen, an analogy to the arrangement in *Myriapoda*, fig. 46, or even perhaps in worms), renders the *Lepidoptera* a summary of the class, and justifies the classification of the *Coleoptera* as the lowest group.

The following is the grouping of the figures on the Plates:—

Plate I. figs. 1-24.—Orthoptera. 25-29.—Neuroptera. 30.—Strepsiptera. 31-63.—Coleoptera.

Plate II. figs. 1-22.—Coleoptera. 23-45.—Hymenoptera. 46-65.—Lepidoptera.

Plate III. figs. 1-10.—Lepidoptera. 11-25.—Diptera. 26.—Aphaniptera. 27-42.—Hemiptera. 43, 44.—Aptera.

Fig. 45-49.—Myriapoda. 45, 46.—Chilognatha. 47-49.—Chilopoda.

Fig. 50-60.—Arachnida. 50.—Scorpionida. 52-58.—Araneida. 59, 60.—Acarina.

ENTOMOSTRACA. When Latreille established the Crustaceans as a separate class, he divided it into two—the *Malacostraca*, including the Decapoda, Amphipoda, and Isopoda; and the *Entomostaca*, embracing all the other members of the class. The term is now restricted to a sub-class, under which are enumerated the *Lophyropoda*, *Ostracoda*, *Copepoda*, *Branchiopoda*, *Cladocera*, *Trilobites*, and *Merostomata*. But these groups are scarcely capable of inclusion

under one definition, which shall at the same time exclude the Cirripeds and parasitic crustaceans. Hence differences exist in the use of the term by various naturalists, and in a few years, probably, the designation will be lost sight of as the progress of embryology leads to more correct views of the affinities of these orders. At present Entomostaca are crustaceans for the most part of small size, whose bodies are protected by a horny or calcareous shell, consisting of one or several pieces, so that the hard part of the animal may resemble that of an amphipod crustacean or a bivalve mollusc; the gills are attached to the locomotive or masticatory limbs; the limbs are jointed, and for the most part spinose (setigerous). The *Ostracoda*, of which the *Cypria* (see plate at CRUSTACEA) is the most familiar example, have a bivalve shell, hinged by membrane along the dorsal middle line. The appendages, never more than five pairs, are entirely covered in by the valves. The modification of the antennæ into swimming organs is a character of the larvæ of higher orders of crustaceans. The Copepoda are crustaceans with elongated articulated bodies, and no shell. The oral appendages are masticatory in the free-swimming form, as *Cyclops* (fig. 32), &c., in which, also, there are four or five pairs of bifurcated swimming feet. In the parasitic genera the mouth is variously modified; the limbs are in five pairs in some genera, wanting in the female but present in the male of other genera. The fish-lice and the parasites of fish-gills belong to this group. The water-flea (*Daphnia pulex*, fig. 30) is the well-known representative of the *Cladocera*, in which the body is not articulated, and is inclosed in a bivalve shell, from which the head projects. The Branchiopoda are flat-bodied, with a shield-like carapace, *Apus* (fig. 29); or laterally compressed with a bivalve shell, *Ethieria*; or elongated, and without a shield or shell, as *Branchipus* and *Artemia*, the denizens of brine pools. The Trilobites (fig. 28), forms which became extinct in the carboniferous strata, are of uncertain position, since they approach, on the one hand, to the Isopods, and on the other to the King Crabs (fig. 27), which are the only living members of the *Merostomata*, among which are numbered *Eurypterus*, *Pterygotus*, and other genera which did not survive the carboniferous period.

ENTOZOA. This term should, according to its literal meaning, include all animals which pass any period of their lives within the bodies of others not belonging to the same species. Thus the ichneumon, whose larva lives in that of the butterfly, the bot of the horse's stomach, are Entozoa, like the tape-worm. But the term is now restricted to those members of the Annuloid group which are commonly known as worms, and which belong to the orders Trematoda, Nematoda, Acanthocephala, Cestoda. The tape-worms belong to the last order: the head, moored by its hooklets in the intestinal walls of its host, is followed by a cylindrical neck, on which transverse markings indicate the commencement of segmentation. The joints are added at this point, so that the terminal joints are the oldest. There is no mouth or intestinal canal, nutrition and growth depending on absorption, through the body walls, of nutritious fluids from the alimentary canal of its host. So far the tape-worm is not parasitic; it does not live at the cost of its host's tissues, but on the food which the host supplies for himself. That it is moored by the head is the only difference between it and such animals as the crustaceans found within the umbrellæ of jelly-fishes, where they swim about and pick up food along with the animal under whose shelter they live. This is true commensalism, it is truly a common table; but the tape-worm actually diminishes, to a small extent, the food taken in by the animal it

infests, though the mischief it causes is by mechanical irritation, not starvation. The ripe joints or *proglottides*, whose sole contents are the reproductive organs and their products, are set free in the intestine, and, escaping externally, are received into the body of another host, in which the embryo leaves the intestine, and in some tissue, brain or muscle, it passes through the cystic or bladder-worm stage, the hydatids of medical authors. Within these cysts appear the *strobili* or heads, which, when the hydatids are digested by other animals, are set free, and becoming attached to the intestinal wall develop into sexually mature tape-worms. The hydatids are truly parasitic; and the developmental history is one of change of form, change of locality, and of habit. The transfer from one animal to another seems essential to the process, which the preference for one organ or tissue also subserves. The transfer from mice to cats, from dogs to sheep, from dogs to man, and the converse, are easily understood, both vegetable and animal food helping to carry the minute eggs or larvae. Among the Trematodes are the Flukes, of which there are several families. These flat-bodied parasites range from one-hundredth of an inch to 4 inches in length. Like the Cestoda they pass through phases, each of which is proper to one kind of animal; but the transfer is from invertebrate to vertebrate forms, and the converse. Thus the larvae, parasitic in fresh-water snails, attain maturity in frogs or ducks. The Nematoda, or filiform parasites, include the familiar thread-worms, the guinea-worm, hairworm. The *Trichina spiralis*, whose larvae occasion the measles of pork, have even caused the death of men by their numbers and their interference with functions. The Acanthocephala, or thorn-headed worms, of which the *Echinorhynchus*, a parasite of the trout and stickleback, is the type, are moored by the spines on their retractile proboscis; they are dependent wholly on absorption for their nourishment, and travel from fresh-water invertebrates to the fish in which they attain maturity. In this sketch of the classification of internal parasites, which will be spoken of in more detail under THREAD-WORMS, TAPE-WORMS, &c., it has been chiefly desired to point out that migration is necessary for development, and that the changes of form always present structural conditions of an adaptive character—that is, there is a relation between the organization of the animal and the locality in which it is found. The species of Entozoa are enormous, many forms being apparently confined exclusively to one animal. The conditions on which their multiplication depend are want of attention in the cleansing of food, contamination of water by the droppings of animals or the decay of their bodies; and, as regards the individuals, an acid state of the secretions, such as accompanies strumous diseases, is essential for their speedy multiplication.

ENTRE-DOURO-E-MINHO, a province of Portugal, more generally known by the shorter appellation of MINHO (which see).

ENTRE RIOS (between the rivers), a province of the Argentine Republic, lying between the Uruguay and the Paraná, the former constituting its east, the latter its west and south limits, the province of Corrientes bounding it north. Its area is estimated at 45,000 square miles. The south extremity is a low alluvial plain, subject to annual inundation; towards the north the country has an undulating surface, with an extensive swamp in the interior, overgrown with low trees. There are, however, some large tracts covered with fine grass, which supplies good pasture for cattle and horses, from which all the articles of export—hides, horns, tallow, and jerked beef—are derived. It has numerous rivers, affluents

of the Uruguay and Paraná. Cultivation is limited to a few places. The climate is moderate and healthy. The population is almost entirely occupied in the *estancias*, or cattle farms, the number of horned cattle being over 4 millions. The capital of the province is Paraná (pop. 24,261); and the population by census of 1895 was 292,019.

ENTRY (in English law). A person who has been wrongfully dispossessed of an estate may, according to English law, in certain cases, assert his right by mere entry or taking possession, which must be done separately in each county if the estate lies in more than one. The right of entry must be asserted within twelve years. It is available only in cases where the entry of the possessor is held to have been wrongful in law. In Scotch law, it is the investiture of an heir by feudal tenure in his estate by the superior.

ENTRY, BILL OF. See BILL—Bill of Entry.
ÉON DE BEAUMONT. See D'ÉON DE BEAUMONT.

EOS (Latin, *Aurora*), among the ancient Greeks the goddess of the dawn, was the daughter of Hyperion and Theia. She announced the coming of Helios (the Sun), and accompanied him throughout the day. She was in the habit of carrying off youths distinguished for beauty, by whom she became the mother of Zephyrus, Boreas, Notus, &c. She begged of Zeus to make Tithonus, one of her lovers, immortal; but she forgot to ask him to add youth to immortality, so when he grew old and shrivelled she metamorphosed him into a cricket.

ÉÖTVÖS, JOSEPH, a Hungarian statesman and author, was born at Ofen on 3d September, 1813. He completed his studies in philosophy and law at the University of Pesth in 1831. He had already, before leaving the university, produced three dramas—*Kritikusok*, *Házasságok*, and *Boszorú*—the last a tragedy, all of which were well received. He began the practice of law as an advocate in 1838, but soon abandoned it to gratify his taste in travel. He visited Germany, France, England, Sweden, and Holland, and on his return published an important work on the reform of prisons (Pesth, 1838). He became a friend of Kosuth, and distinguished himself as a journalist and in the diet. A collection of his political writings was published in Leipzig in 1846. He still continued to give his leisure to literature, and published a succession of novels—*The Carthusian* (1847); *The Village Notary* (*A falu' jegyzője*, which has been translated into English), 1844-46; Hungary in 1514 (1847-48)—giving vivid pictures of Hungarian life in modern and more remote epochs. After the revolution of 1848 he became minister of public instruction under Batthyány, but in a few months he resigned his post and retired to Munich. He remained in voluntary exile for three years, during which he published several works, among which was *The Influence of the Ideas of the Nineteenth Century on the State of Society* (Vienna, 1851). About the middle of this year he again returned to Hungary, where he remained for about ten years without mixing in politics. During this period he was made vice-president of the Hungarian Academy in 1855, and president in 1866. In 1867 he again became minister of public instruction. He died 2d February, 1871.

EOZOON. This remarkable animal form, the oldest fossil hitherto obtained, was recognized as organic in 1859 by Sir W. Logan, director of the Canadian survey. In 1864 Principal Dawson, of Montreal, ascertained its rhizopodal character, and his judgment has been confirmed by Carpenter, Rupert Jones, Reuss, and other observers. The limestone in which the fossil occurs are highly altered members of the gneissous rocks which are associated as the

Laurentian series of North America, and which, as Dana has shown, are still manifest as at first the shores, and later as the axis of the earliest American land. The fossiliferous portions of the limestone bands are made up of alternate layers of white and green material, the latter being serpentine, the former carbonate of lime and white augite. These superposed layers represent the walls and cavities of a gigantic foraminiferal mass, the cells of which lodged each an individual rhizopod, which is represented by the serpentine that now fills the cavity, while the walls of the chamber are indicated by calcareous matter. After maceration in acid and the removal of the lime, the serpentinous cast of the cells is left, and three kinds of processes are now distinctly seen, namely, circular rods which pass from the cells of one layer to those of another; stoloniferous processes which connect the cells of each layer, and tufts of pseudopodia which ramify in the calcareous skeleton. The stoloniferous processes indicate the point at which, by gemmation, the zooids, as each of these individuals should more strictly be called, are given off by budding; while all serve to maintain organic connection between the different parts of the colonial mass. The structure is of great interest, since it combines the features which are now characteristic of two distinct groups: the existing Foraminifera are definite in shape, are small in size, and are unattached; the sponges are less regular in form, are attached, and are of various sizes. The earlier form, therefore, is an example of that differentiation which is an essential point in evolution. The organic character of the Eozoon has been disputed by various competent authorities on the ground that all the points of structure may be found in the mineral kingdom: but the extreme improbability of all the peculiarities of several minerals concurring over so wide an area of limestone seems to raise an insuperable objection to this explanation of the phenomena. The Eozoon is found in the upper and lower divisions of the Laurentian of Canada, and as these are separated by an unconformity which marks an uncertain interval of time, and are unconformably covered by the Huronian, the antiquity of this fossil is enormous. It may be separated from the commencement of the Silurian series by a period as great as that of the Palaeozoic and Mesozoic formations put together. Eozoon has been detected in the fundamental rocks of Bohemia and Bavaria, as well as of Scandinavia, and the presence in these localities of graphite indicates the existence of vegetation at the same early period. Whether or not the smaller size of the European forms is a specific distinction is uncertain, since it must be remembered that the lowest types of organization are those which persist longest without change. It is now certain that the Connemara marble, or Irish green of commerce, does not contain Eozoon, not one of the structural features above mentioned having been detected in it.

EPACTS (*epactos*, added), in ecclesiastical chronology, are the excesses of the solar month above the lunar synodical month, or of the solar year above the lunar year. These excesses are calculated by two different methods—the Italian and the Gregorian. By the former method the solar year is supposed to consist of 365 days, the lunar of 354 days; the difference in one year is therefore 11 days, in two years 22 days, in three years 33. When the difference exceeds 30 days an intercalary lunar month of 30 days is added to the lunar year, which then consists of 13 months, the remaining difference being 3 days. To this 11 is added, again making 14 days. This addition of 11 days, with deduction of the even 30's to form intercalary months, is continued for a cycle of 19 years, giving the following series of epacts: 11, 22,

8, 14, 25, 6, 17, 28, 9, 20, 1, 12, 23, 4, 15, 26, 7, 18, 29. As the next epact would give 10 instead of 11 one more is added to recommence the cycle, making the 20th epact 12 instead of 11, and then the series proceeds as before. In using this cycle one day must be added to the lunar month in leap-years, in which the 29th day of February is included. The lunations are supposed to consist of 29 and 30 days alternately, with the exception of the intercalary lunations, which all consist of 30 days, with one of 29 days at the end of the cycle, that is, instead of making the 20th epact 12, and deducting 30, as explained above, the intercalary month at the end of the cycle may be made 29 days and the epact 11 as formerly. The number of any particular year in this cycle is called its *Golden Number*. As the cycle is supposed to commence with a year in which the new moon falls on the 1st of January, which makes the cycle begin one year earlier than the commencement of our era, by adding 1 to any year of the vulgar era and dividing the sum by 19, the quotient will give the number of cycles elapsed from the beginning of the Christian era, and the remainder the Golden Number of that year. If there is no remainder the year will be the 19th or last of the cycle. The new moons by this calendar sometimes differ from the real new moon by as much as 2 days. The Golden Numbers are marked in the calendar by Roman letters. The use of this cycle requires corrections both for the lunar and the solar year. Hence a new calendar was constructed by Luigi Lilio (Aloysius Lilius), called the Gregorian Calendar of Epacts. It fixes the epacts for an indefinite period without regard to natural phenomena.

EPAMINONDAS, a Theban hero, who, for a short time, raised his country to the summit of power and prosperity. He was born about 418 B.C., and was descended from a noble family, but was reared in poverty. Throughout life he was distinguished for the friendship subsisting between him and Pelopidas, which is supposed to have originated in a campaign in which they fought together for Sparta against Mantinea. He was sent to Sparta B.C. 371 to represent Thebes in negotiating a peace with the Athenian envoys. As the Spartans refused to recognize Thebes as the representative of Boeotia, the Thebans were excluded from the peace. Cleombrotus was sent by the Spartans to invade Boeotia, but was defeated at Leuctra (B.C. 371), chiefly through the tactics of Epaminondas. Two years after Epaminondas and Pelopidas were made Boeotarchs. They invaded Peloponnesus together, detached several nations from the alliance of Lacedæmon, and delivered the Messenians, whose capital they rebuilt. Epaminondas then marched with his army to Sparta; but this city was so bravely and skillfully defended by Agesilaus that the Theban hero, finding winter approaching and the Athenians now in declared hostility with Thebes, evacuated Laconia, after laying waste the low country. An accusation was brought against him on his arrival in Thebes, because he and Pelopidas had kept the Boeotarchate beyond the legal time; the accusation was literally true, but the infringement of the law was justified by his services, and after having pled his own cause, he was acquitted. In 368 he again invaded the Peloponnesus, and although opposed by the allied forces of Sparta and Athens, he compelled Sicyon and Pellene to relinquish the Lacedæmonian alliance, but was repulsed in an attack on Corinth. In the same year he served in a Theban army sent into Thessaly to rescue Pelopidas, who was kept a prisoner at Pheræ, and in the following year he commanded an expedition with the same object which was successful. In 366 he again invaded the Peloponnesus, but the fruits of this invasion were lost by

political intrigues, and in 362 he was compelled again to make head against a formidable coalition of states, including Athens and Sparta. His tactics were never more brilliant and successful than in this campaign, but in the battle of Mantinea, in the same year, he was killed at the moment of victory.

EPAULETTE, a military ornament worn on the shoulder, and made of worsted, silver or gold lace, &c. Sometimes one is worn and sometimes two, according to rank. Their origin has been traced to the knot by which the various pieces of the armour were attached to the shoulder. In the French service the epaulette was made a regular part of the uniform by an ordinance in 1759. Epaulettes were worn in the British army till 1855, and they are still worn in the navy, the different ranks of the wearers being distinguished by crowns, anchors, stars, &c., worked on the epaulette.

EPÉE, CHARLES MICHEL, ABBÉ DE L', a celebrated benefactor of the deaf and dumb, was born on Nov. 25, 1712, at Versailles. He chose the clerical profession, and became a preacher and canon at Troyes. The idea of communicating with the deaf and dumb by means of a language of signs, though not first conceived by him (see DEAF AND DUMB), arose in his mind without any foreign suggestion. He first tried this mode of instruction on two sisters, and found his efforts so successful that he resolved to devote his life to the business. He not only established an institution at his own expense, but spent his whole income, besides what was contributed by benevolent patrons, in the education and maintenance of his pupils. He never could accomplish his favourite project, an institution for the deaf and dumb at the public expense, which was first obtained by his successor, the Abbé Sicard. He died at Paris on Dec. 23, 1789, leaving several writings relating to his system.

EPÉRIES, a town of Hungary, capital of the county of Saros, in a beautiful district on the Tarcza, 140 miles N.E. of Budapest. It is walled, and consists of the inner town, which is well built and has one very fine main street, and of two large suburbs. The fire of 1887 destroyed much of the town, and it has since been largely rebuilt. It is the seat of a bishop's see, and of several courts and public offices, and contains a Protestant and several Roman Catholic churches, a town-hall, a Protestant college, and a Roman Catholic gymnasium and high school; has manufactures of woollen and linen cloth, delft-ware, &c., and a considerable trade, particularly in grain and linen. Pop. (1900), 14,447.

EPERNAY, a town of France, in the department of the Marne, on the Marne, 15 miles south-west of Reims, 20 north-west of Châlons. The river is here crossed by a bridge of seven arches. The town contains a communal college, a library with about 28,000 volumes, and a theatre. It is a centre of the wine trade of Champagne, and has various manufactures connected with that industry, besides glass-painting, brewing, tanning, wool-spinning, and a trade in grain, flour, &c. Its wine cellars contain about five million bottles of wine, of which about 800,000 are annually produced by the arrondissement of Epernay. The vast cellars form a labyrinth of galleries cut in the calcareous rock of the district. Pop. (1896), 18,788.

EPHEMERIDÆ, a family of Neuropterous insects characterized by the slenderness of their bodies; the delicacy of their wings, which are erect and unequal, the anterior being much the larger; the rudimentary condition of the mouth; and the termination of the ten-jointed abdomen in three-jointed filiform appendages. The adult *May-flies*, or *day-flies*, as they are called, emerge from the chrysalis on

the banks of the running streams in which the eggs are hatched, and, appearing usually towards sunset, are no less remarkable for their great activity than for their enormous numbers, and the brief period of their existence. The eggs, which are shed in a mass, drop into the water. The larvae have elongated depressed bodies; setose antennae, and long caudal filaments; and lamellar or tufted gills, symmetrically disposed on either side of the abdomen. They remain in the water for a year or two before undergoing further change, lying beneath stones, and leading a predaceous life, for which their strong jaws fit them. The rudiments of wings mark the commencement of the nymph stage, at the close of which they crawl out of the water, and cast the nymph integument. Their sexual immaturity prior to the second moult has led to their being named, at this stage, subimagos or pseudimagos. The larvae, which are very similar throughout the family, are largely used as bait. There are about fifty British species. *Ephemera* and *Cenis* have three caudal filaments; *Palingenia* and *Cloe* only two, but the larvae have three. The posterior wings are absent in *Cloe* and *Cenis*. *E. vulgata* and *E. danica* are two very common species. The family is widely distributed, and in some seasons or localities they are so numerous that the bodies have been used as manure. See Pl. I., fig. 19, at ENTOMOLOGY.

EPHEMERIS, an astronomical almanac. The plural *Ephemerides* is applied to tables showing the places where the planets and heavenly bodies are found at noon of every day. It is from these tables that eclipses, conjunctions, &c., of the planets are determined. See ALMANAC (NAUTICAL).

EPHESUS, anciently a Greek city of Lydia, in Asia Minor, one of the twelve Ionian cities, on the south side of the Caystrus, near its mouth, a great emporium of trade, having a convenient and spacious harbour. It is now represented by the village of Ayasoluk, about 36 miles from Smyrna, on the railway to Aidin. After belonging to the Ionians, it fell successively under the dominion of the Lydian and Persian kings. Its importance as a commercial city dates chiefly from the time of Alexander the Great. The Apostle Paul lived for two years at Ephesus and established a Christian church there, to which he addressed one of his epistles. Timothy succeeded St. Paul, and St. John is said to have had charge of the church after Timothy, and to have died at Ephesus. It was long famous for its temple of Artemis (Diana), called *Artemision*, reckoned one of the seven wonders of the world. The temple was of the Ionic order, and was adorned with many pillars, each 60 feet high, and with numerous statues and paintings by the most celebrated Grecian masters. It had been destroyed seven or eight times before Pliny wrote, particularly by the notorious Herostratus, 356 B.C., whose only object in burning the temple was to perpetuate his name. The temple, however, was rebuilt with more magnificence than ever by the Ephesians, whose women contributed their trinkets to the general fund raised for this purpose. There were also many other temples here, a great theatre, a great stadium or race-course, gymnasia, odeum, &c. The site of the great temple had become lost when it was discovered and excavated by Mr. Wood in 1867-69. He found that the building measured about 348 feet by 184, and stood on a raised platform measuring 418 feet by 239. Important excavations have since been carried out here, and the great theatre, important buildings connected with the great gymnasium, and a splendid semicircular marble portico round the east side of the harbour have thus been disclosed. The Great Mosque or Church of St.

John, the cave of the Seven Sleepers, and other interesting objects are to be seen here.

EPHOD, a species of ornament worn by the Jewish priests. That of the high-priest formed a rich covering of gold, blue, purple, and crimson cotton cloth, with a breastplate attached to it, consisting of two large precious stones, on which the names of the twelve tribes were engraven. That of the other priests consisted only of plain fine linen.

EPHORI, a species of magistrates common to many Dorian communities, of whom the most celebrated were the Ephori of Sparta. The origin of the Ephori is not known, but their office in Sparta served as a counterpoise to the king and council. Their number was five. They were elected by the people without restriction as to qualifications. They entered on office after the autumnal solstice. They superintended the morals and domestic economy of the community. They scrutinized the conduct of all magistrates, including the kings themselves, who, in course of time, fell completely under their control. Cleomenes murdered the Ephors for the time being, and abolished the office, B.C. 225. It was restored by the Romans.

EPIRAEM SYRUS, theologian, was a Syrian, born at Nisibis about 325, died at Edessa in 373 or 378. He devoted himself to a monastic life, and constantly refused preferment, but after settling in Edessa (about 365) he was ordained a deacon. He knew no language but the Syrian, but was a fertile writer on theological and moral subjects, a contriver of heresy, as well as an exhorter of the faithful. His works have been published in Syriac, Greek, and Latin. They were collected by Gerard Voss, who published them in Latin at Rome, Cologne, and Antwerp, from 1589 to 1619. Besides theological and moral treatises, they contain numerous homilies, and a large number of hymns designed to supersede others of a heretical character, are also attributed to him.

EPIC, a poem of the narrative kind. This is all that is properly signified by the word, although we generally understand by it a poem of an elevated character, describing the exploits of heroes. Without entering into the various theories of epic composition, we shall state the views of one of the most distinguished critics of our age—A. W. von Schlegel—on this subject. As action is the object of the drama, so narration is that of the epic. But as the event related is something already past, the epic is less stirring than the drama, which represents an action as just happening, and therefore fills the mind with a lively excitement; hence the more quiet tone of the epic, and the pauses which may be allowed in the interest of the description, whilst the character of the drama is to set before the spectator a rapid succession of actions, and completely engross him in the exhibition; hence, too, the poet is allowed to introduce passages of philosophical reflections (the frequency and propriety of which, of course, must be regulated by the taste and judgment of the writer); nay, the very epithets by which the persons and events of the epic poem are designated are of a descriptive character, and indicate the poet's observation of what is going on; whilst in the drama he must not make himself visible at all. The epic is not a hasty journey, in which we hurry towards a certain end, but an excursion, on which we take time to view many objects on the road, which the art of the poet presents to amuse us. Jean Paul Richter, in his *Vorlesung der Aesthetik* (Introduction to *Aesthetics*), says on this point: 'The epic poet may fly from region to region, between heaven and hell, but he must, at least, describe his flight and his way. Slow and prolonged description is

allowed in the epic. Hence the propriety of a calm and minute description of the shield of Achilles; hence the propriety of the episode. The multitude of actors retards, like a number of wheels in clock-work, the course of the machine; since each actor requires room for his action. Novels are epic compositions, and follow the same rules. Yorick's journey occupies but three days; the fifth book of *Don Quixote* is confined to one evening in a tavern. The action of the poem becomes tedious, it is true, in case of repetition, and stops when action foreign to the main purpose is introduced; but the main action of the poem may be divided into parts without being exposed to the charge of these faults, as the unity of a day is not destroyed by its division into hours.' Unity, indeed, is necessary in the epic as in every poem, and, in fact, in every production of art. But this unity need not be so scrupulously observed as in the drama. A writer of genius may be allowed to overstep the rules, and say, 'I do not intend to give you a perfect epic, but merely fragments,' as Byron has done in the case of the *Giaour*. Such productions, however, must always remain exceptions to the class of epic compositions.

From what has been said, it appears that the epic may treat of very different subjects, grave and elevated like Dante's and Milton's poems, glowing and romantic like Ariosto's and Wieland's epics, cheerful and ludicrous like Tassoni's and Butler's admirable productions. Accordingly, epics have been divided into heroic; mock-heroic, as Pope's *Rape of the Lock*, or *La Secchia Rapita* (The Rape of the Bucket), or Boileau's *Lutrin*; romantic, as Tasso's *Jerusalem Delivered*; allegoric, as Dante, &c.; but these divisions can never be very definite, as they pass imperceptibly into each other. Whilst Homer is, we might almost say, plastic, Ariosto is almost lyric, and always descriptive in quite another style, and Milton often pours forth his religious sentiments in a didactic strain; yet the poems of all are epics.

Among the modern languages of Europe, none is so well adapted to description as the English—a circumstance to which, probably, is partly owing the great number of English epics, or poems of an epic character, of which many are truly beautiful, including all varieties, from the sublimity of *Paradise Lost* to the wit of *Hudibras*. Spenser, Milton, Glover, Butler, Pope, Scott, Byron, Moore, Campbell, Southey, and many other distinguished names, are embraced in the list of English epic writers.

In the number of good epics, however, the Italians excel the English, and can produce three, at least, of the highest character, while the English have but one of the highest rank to oppose to them: these three are Dante's *Divina Commedia*, one of the grandest productions of the human mind; Ariosto's *Orlando Furioso*, the flower of romantic poetry; and Tasso's *Gerusalemme Liberata*, a poem which, if less spirited and original than Ariosto's, abounds in narrative interest, and cannot be surpassed in sweetness and harmony. The Italians are very rich in burlesque and satirical epics.

The Germans possess one great ancient epic, the *Nibelungenlied*, a poem of the grandest design, and of the highest rank in regard to the characters described, excelling in this respect the *Iliad* of Homer; the chief personage of which is violent, self-willed, and incapable of self-government, so as to fall far below the rank of a true hero, whose attributes should be firmness and self-command, a spirit unshaken in adversity, and an intellect adequate to every exigency. But, in respect to poetical execution and beauty of language, the *Nibelungenlied* cannot be compared with the Ionic rhapsodies. Of a very early date, likewise, is the satirical epic *Bay-*

nard the Fox, a poem alike original in design and execution, in well-conceived and well-executed satire. It may be considered a model of satiric epic poetry. The greatest modern epic of the Germans is the *Messias*, by Klopstock, which we consider faulty in its very conception, as the life of the Saviour offers but little matter suitable for the epic poet, so that the poem, in general, has little of an epic character. It is not much read in Germany; when perused, it is generally as a task, and from a feeling of duty. In modern times the Germans have had several epics from Wieland, Schultze, and others; but he who has enjoyed Camoens, Ariosto, and the epics of the British poets, will not think that the German epics rise in value by comparison: still less should we think of extolling those German epics which partake more or less of the character of idyllic poetry; and the most celebrated of which is Goethe's *Hermann and Dorothea*, a poem much esteemed by his countrymen in general (but in which we were never able to take any great interest), giving quaint descriptions in incorrect hexameters: it must be remembered, however, that, when this poem was written, hexameters, in German, were something new, and the standard of correctness had then not been raised so high as it has since been, chiefly by the exertions of A. W. von Schlegel. Still less could we ever relish the *Louisa of Voss*, a poem which treats in regular epic style the scenes in the life of a country clergyman, and in which the standing epithet *ehrwürdig* (venerable) is as often and gravely repeated whenever 'the pastor of Grunau' is mentioned, as *swift-footed*, in Homer, with the name of Achilles. Descriptiveness is not so prominent a feature in the German language as in the English, and therefore it does not so naturally lead to epic poetry.

The most important epic of the Spaniards is *Erccilla's Araucana*, a poem, which to foreigners generally appears like a dull chronicle, defective in poetical conciseness of language and originality of ideas. The Spaniards possess several epics of an allegorical-religious character.

One of the noblest of epic productions is Camoens's *Lusiad*, which, like a magnificent flower, sprung naturally out of a heroic and glorious age, and which, in spite of the many animaladversions on particular parts of it, in which the taste of the age may have prevailed over the higher claims of poetry, will be prized as long as noble ideas and beautiful descriptions are valued.

The French language, the chief traits of which are precision, and an agreeable and often charming vivacity, is not very well adapted for the epic, which, not to become tedious in the slow progress of the narrative, requires a copious and descriptive language: qualities for which the French language is by no means remarkable. The *Henriade* strikes most foreigners as a failure, in which the author's intellect is more conspicuous than his poetical genius. Boileau's comic epic, the *Lutrin*, is much admired. The difficulties of the French language as a poetical medium have led many of its most distinguished writers to prefer prose to verse in works of imagination. Hence a series of works such as Fénelon's *Télémaque*, Marмонтel's *Incaas*, St. Pierre's *Paul et Virginie*, and many others, which, though less regular in form than the pure epic, are quite distinguished from the common novel or ordinary prose fiction, and may be considered as a distinct class of prose epics.

Of the Greek epics, it is well known that Homer's *Iliad* and *Odyssey* are the principal. Much the most distinguished Roman epic is the *Æneid* of Virgil. Lucan's *Pharsalia* is rather a historical chronicle than an epic. It is intended as an apotheosis of Pompey. The licentious Petronius also wrote an

epic on the civil wars of Caesar and Pompey. Valerius Flaccus, contemporary of Vespasian, wrote an epic on the Argonauts, too close an imitation of the *Argonautica* of Apollonius Rhodius. There are, however, some noble passages in Valerius Flaccus. Silius Italicus wrote an epic on the second Punic war. Statius, contemporary of Domitian, is the author of the *Thebaid*, which he dedicated to this corrupt tyrant. His style is bombastic and affected; but he is a writer of genius. Dante acknowledges this in his poem.

EPICHARMUS OF COS, a Greek philosopher of the Pythagorean school, born at Cos about 540 B.C., lived in the early part of the fifth century before Christ, at Syracuse, and there wrote his celebrated comedies, now lost. Their number is reckoned at fifty-two, and the titles of forty of them have been preserved. Before commencing his career as a comic poet, which he did somewhat late in life, he lived at Megara, engaged in the study of philosophy, both physical and metaphysical. The fragments of his poems which are preserved exhibit the results of his course of study. They abound with philosophical maxims, and with speculative discourses. His genius was highly esteemed among the ancients by such judges as Plato and Cicero. The Sicilian comedy of Epicharmus, prior to the Attic, grew out of the mimes, which were peculiar to this island, making a sort of popular poetry. He arranged the separate unconnected scenes, exhibited in the mimes, into continued plots, as in tragedy. His comedies were long regarded as models in this species of composition, and were as much distinguished by their knowledge of human nature as by their wit and lively dialogue. The Sicilian comedy, in opposition to the Attic-Ionic, is also designated as the Doric comedy. He died B.C. 450, about ninety years of age.

EPICTETUS. This celebrated Stoic was born at Hierapolis, in Phrygia, about A.D. 60, and lived at Rome, where he was the slave of Epaphroditus, a brutal freedman of Nero, whose abuse and mal-treatment he bore with fortitude. Epictetus himself did not leave any written account of his doctrines, which appear to have been of the most elevated kind. In his discourses he aimed to impress his hearers with the love of practical goodness. He did not despise knowledge, but considered it as a means to an end. The foundation of philosophy he held to be the perception of one's own weakness and inability to do what is needful. From this arises the study of philosophy to discover a standard of good and evil. The philosopher he considers the messenger of Zeus to correct the erroneous notions of men on these subjects, and lead them back to themselves. His doctrines approach more nearly to Christianity than those of any of the earlier Stoics, and although there is no tract in what is recorded of them of his having been directly acquainted with Christianity, it is at least probable that the ideas diffused by Christian teachers may have indirectly influenced them. (See Dr. Smith's Dictionary of Greek and Roman Biography and Mythology.) The excellence of his system was universally acknowledged. Domitian banished him with other philosophers from Rome; for the tyrant could not but hate men whose principles breathed scorn of all injustice and wickedness. Epictetus settled in Epirus, and although he possessed the favour of Hadrian, there is no evidence that he returned to Rome. Arrian collected the sayings of Epictetus, his teacher; we have them still under the title of *Enchiridion*. Besides this manual we have four books more of philosophical maxims by him. Of both works, especially of the *Enchiridion*, there have been many editions. There is an English translation of Epictetus by Long in Bohn's Classical Library.

As a proof of the high respect in which Epictetus was held, it is said that his study lamp was sold after his death for 3000 drachmas (£120).

EPIUREAN PHILOSOPHY. See EPICURUS.

EPICURUS, the founder of a celebrated philosophy, was the son of Neocles and Chærestrata of Gargettus, whence he is sometimes called the Gargettian. He was born in the island of Samos, B.C. 342, and spent there the first eighteen years of his life. He then repaired to Athens (B.C. 323), where he is said to have enjoyed the instructions of Xenocrates, then at the head of the Academy, but this he himself does not admit. Epicurus generally denied his obligations to other philosophers. Although some parts of his system are evidently borrowed from his predecessors, he claimed to be self-instructed, and treated his teachers with hostility and contempt. His stay at Athens, however, was brief; and on leaving it he went to Colophon, where his father was engaged in teaching, and began himself to give lessons in grammar. It was here, according to some accounts, that his attention was first turned to philosophy. He himself says he began his philosophical studies at the age of fourteen, but they may have subsequently taken a more distinct development. The inability of the grammarians to explain a passage about Chæon and the accidental possession of a copy of the works of Democritus are variously assigned as the cause of this new or more decided direction of his mind. From Colophon he went to Mytilene and Lampsacus, where he engaged in teaching philosophy. He returned to Athens B.C. 306, and purchased a garden in a favourable situation, where he established a philosophical school. Here he spent the remainder of his life. His mode of life appears to have been simple and temperate. He abstained, as a principle, from politics, and took no part in public affairs. During the latter part of his life he was afflicted with severe physical suffering. For many years he was unable to walk, and about a fortnight before his death his maladies were aggravated by the formation of stone in his bladder, which brought his life to a close amid acute suffering at the age of seventy-two, B.C. 270. All this was borne with heroic courage and constancy.

The pupils of Epicurus were numerous, and they were enthusiastically devoted to him. This is probably to be ascribed, in part at least, to the kindness of his natural disposition, and the attachment he always manifested to his friends. His philosophical doctrines were also followed by his leading disciples with scrupulous exactness, so that the Epicurean philosophy may be said to be contained entirely in the doctrines of Epicurus. Epicurus, as already observed, claimed to have arrived at his philosophy as the result of independent thought and investigation. He, however, adopted both in his physical and ethical theories some of the fundamental positions of his predecessors. Even assuming his claim to be well founded, this was, indeed, inevitable. He is said in some things to have misunderstood the views of Democritus and Diagoras, from whom he borrowed the atomic theory of the physical universe. This may, perhaps, show that he had never formally studied them, and that he formed his system only from such an incidental knowledge of them as an intelligent man must have of the current theories of his day. Like Democritus he derives all material forms from a concourse of atoms or minute particles of matter. We derive our conceptions of things from *eidola* or images reflected from the things themselves. Even the gods are atomic, and our knowledge of them, as of other things, is ideal. The ethical system of Epicurus, which formed the culminating point of his doctrine, was, like his physical system, based on a

principle already promulgated, but developed independently of the views of his predecessors. Its fundamental maxim was that of the Cyrenaic school, that pleasure and pain are the chief good and evil, the attainment of the one and the avoidance of the other of which are to be regarded as the end of philosophy. He differed from the Cyrenaics, however, in giving, or endeavouring to give, a moral tendency to this doctrine. He exalted the pure and noble enjoyments derived from virtue, to which he attributed an imperishable existence, as incalculably superior to the passing pleasures which disturb the peace of mind, the highest good, and are therefore detrimental to happiness. Peace of mind, based on meditation, he considered as the origin of all good. The philosophy of Epicurus has been violently opposed and frequently misrepresented, but while it is not open to the charges of gross sensualism which have been brought against it, and which are more justly chargeable on the earlier Cyrenaic school, it cannot be considered as much better than a refinement of sensualism. The atomistic theory, as developed by Epicurus, has been charged not unjustly with atheistic consequences, and if the faith in virtue displayed in his ethical system may be supposed to indicate a higher origin, the virtue itself which Epicurus exalts may very well be called in question. When once the position is laid down that virtue consists in the pursuit of pleasure, there does not appear to be any effective answer to those who would place it in the pursuit of more active pleasures than Epicurus recommends. Thus his doctrine, however he may have meant it as an instruction in the superiority of moderation and virtue, is justly liable to the charge of placing the preference of virtue on too feeble a foundation, and of opening a wide door to all manner of abuses.

Epicurus was a very voluminous writer. His works, however, are represented as full of repetitions and quotations. In ancient times his philosophy appears to have been more popular in Greece than in Rome, although his disciples were numerous in both. This is easily comprehended, as it was in fact a system engendered by the decline of public virtue in Greece, while the severest stoical philosophy was better adapted to the still active public spirit of Rome. In the Epicurean system, there are, as will be observed, strong points of resemblance with many modern systems, and many modern works of controversy have been written directly on the Epicurean system. Little is left of the numerous writings of Epicurus. Some fragments of a Treatise on Nature were found at Herculaneum, and published by Orelli (Leipzig, 1818). All other fragments have been published by Usener in his *Epicurea* (Leipzig, 1887). The chief account of his philosophy is contained in the great poem of Lucretius *De Rerum Natura*, one of the masterpieces of Roman literature. We also have additional information from Diogenes Laërtius, Cicero, Pliny the elder, &c. A modern account of this philosophy is given by W. Wallace in his *Epicureanism* (1880).

EPICYCLE, in the ancient astronomy was a subordinate orbit or circle, which was supposed to move on the circumference of a larger one called the *deferent*; by means of which one motion, apparently irregular, was resolved into two that were circular and uniform. And when the observed motion was so irregular and complicated as not to be resolved with one epicycle, others were added, till a nearer approximation was obtained. This system owed its origin to a prejudice that seems to have been extremely ancient, in favour of circular motion; and the problem that principally engaged the attention of astronomers in those times was to assign the proper proportion of the *deferent* and *epicycle* which

should approximate nearest to absolute observation. See **ASTRONOMY**—History of.

EPICYCLOID, in geometry, is a curve generated by a point in one circle, which rolls on the circumference of another circle, either on the concavity or the convexity, and it thus differs from the common cycloid, which is generated by a point in a circle that rolls along a right line. The latter has sometimes been assimilated with the former, by considering the right line as the circumference of a circle whose diameter is infinite. The invention of epicycloids is ascribed to M. Roemer, the celebrated Danish astronomer.

EPIDAUROS, one of the most considerable towns and commercial seaports of ancient Greece, situated in Argolis, in the Peloponnesus, particularly celebrated for its magnificent temple of *Æsculapius*, which stood on an eminence not far from the town. An inscription over the entrance declared it to be open only to pure souls. Crowds of invalids resorted to the place in hopes of obtaining a cure from the beneficent divinity, in whose honour festivals were celebrated yearly.

EPIDEMIC, or **EPIDEMIC DISEASE** (from *epi*, and *demos*, among the people), signifies a state of sickness which prevails in a place or tract of country only for a temporary period. The term epidemic indicates only that the disease is common to or prevailing among a people. In this sense, this wide general signification, the word epidemic is very often applied, and is now and again made use of in general literature, apart altogether from questions of disease. Thus one has heard a public speaker, in reference to a prevalent tendency of political opponents to misrepresent one another's utterances, talk of an 'epidemic of lying'; and the observation that a great crime, which has attracted much public attention, is apt to become the commencement of a period when crimes akin to it suddenly increase to an alarming extent, has been emphasized by the use of the phrase 'an epidemic of crime'. In these instances the word is used to imply the prevalence of the thing referred to, with, however, something of the suggestion that the numerous cases are dependent to some extent the one on the other, owing to some tendency of the human mind to 'follow a lead', or to imitate.

In the use of the word epidemic in medicine, this, that is merely a suggestion in the general use of the word, becomes an essential part of its meaning. Usually when one speaks of an epidemic disease, there is meant not only a disease which is prevalent, but a disease which is prevalent because it has a particular cause which is operating upon a large number of people at a time. The specially epidemic diseases are such as scarlet fever, measles, whooping-cough, diphtheria, typhus and typhoid fever, cholera, yellow fever, plague, &c. In these cases the disease is due to a specific poison, gaining entrance to the body of the patient by the medium of food or drink, or air, and multiplying there, the poison being thereafter cast off from the body of the patient, and being capable of infecting another person. Thus, in such cases, the wide prevalence and extension of the disorder depend upon the fact that a patient suffering from it becomes a new centre for propagation. But, because infectious diseases are the best illustrations of epidemic diseases, it must not be supposed that the idea of infection is an essential part of the meaning of epidemic. A disease may be epidemic, which yet, so far as present knowledge extends, is not infectious or contagious, although the attendant circumstances may give support to this belief. One of the best illustrations of an epidemic disease which is not contagious is that of influenza. It suddenly affects large masses of people simultaneously; it ap-

pears simultaneously in places widely separate from one another; and it appears on board ship in mid-ocean under circumstances which render the theory of infection, as ordinarily understood, inapplicable. So that one is driven to conclude its cause to be dependent upon some peculiar atmospheric influence, common, therefore, to large numbers of people at the same time, but not infectious, and therefore not passing from one to the other as those other diseases already named.

EPIDERMIS (from *epi*, upon, and *derma*, the true skin), the scarf-skin. See **CUTICLE** and **SKIN**.

EPIDOTE. This mineral is found crystallized in rhombic prisms variously modified, both laterally and at its extremities. It cleaves parallel to the sides of a right-oblique-angled prism of $115^{\circ} 36'$, and $64^{\circ} 24'$, which is therefore its primary crystal. Some of its more interesting secondary or actually occurring forms are the following, viz.: 1, the primary crystal, altered by the truncation of its acute lateral edges, and terminated at both extremities by dihedral summits; 2, the same, but terminated by four-sided pyramids, whose apices are truncated; 3, the primary crystal, with all its lateral edges truncated and terminated as in the last instance. The prisms are generally striated longitudinally; lustre, vitreous; colour, green and gray prevalent. Among the most common shades of the first is pistachio-green; the gray colours pass into white; translucent on the edges, and sometimes transparent; brittle; hardness, above that of felspar, and little inferior to quartz; specific gravity, 3.26 to 3.42. Some of the larger crystals from Norway consist of concentric coats, the outer ones of which, being peeled off, leave a crystal with smooth faces. Twin crystals are often observable. When massive, the individuals are columnar, straight, and either parallel or divergent; they are sometimes granular, and even become, occasionally, impalpable, when they are strongly connected. The deep green varieties are called, in common language, *epidote*, while the gray are denominated *zoisite*; some mineralogists consider that no distinction exists between the two, except what arises out of colour, while others maintain that they are different, since their crystalline forms do not coincide in any particular. The granular variety has also been distinguished by the separate appellation of *scorza*; and a light reddish-black variety from Piedmont, which is highly charged with oxide of manganese, has been called the *manganian epidote*, the bright red from Glencoe, in Scotland, being termed *wulhamite*. Another species, *allanite*, contains the rare elements, cerium, lanthanum, and yttrium. The chemical composition of epidote is as follows, the specimen analyzed consisting of the green variety from Norway: silica, 37; alumina, 21; lime, 24; oxide of iron, 16; oxide of manganese, 1.50. Before the blowpipe this species melts, with much intumescence, into a greenish transparent glass, and gives a deposit of moisture. This water seems a regular constituent. It is not easily acted on by acids, but after ignition it gelatinizes. Epidote is found in the oldest rocks, in which it occupies drusy cavities, or narrow veins, being irregularly distributed through them, without ever entering into their composition, as a regular ingredient. Magnificent crystals of it, 2 or 3 inches in length, and 1 or 2 in diameter, are found at Arendal in Norway, and are hence called *Arendalite*. Similar varieties occur in Sweden, and at Franconia, New Hampshire. Finely crystallized specimens come from Piedmont; and the zoisite variety is found in the Tyrol, and in a great number of places in the United States. The transparent crystals, of a fine colour, are sometimes wrought by the lapidary; though they are esteemed of little value in jewelry.

EPIGASTRIC (Greek *epi*, upon or above, and *gaster*, the stomach). That part of the abdomen that lies over the stomach is called the *epigastric region*. It reaches from the pit of the stomach to an imaginary line above the navel, supposed to be drawn from one extremity of the last of the false ribs to the other. Its sides are called *hypochondria*, and are covered by the false ribs, between which lies the *epigastrium*.

EPIGENESIS. What evolution is for the changes that take place throughout nature, epigenesis is in the development of the ovum. The generative stimulus is followed by growth of the protoplasm of the ovum and its differentiation, so that the homogeneous material passes through the stages briefly described in the art. **REPRODUCTION**. There is a gradual specialization of parts, whereby the homogeneous matter assumes the successive complications of an organized body. There is no speciality of the protoplasm, save that it is present in organs which place it under the most favourable conditions for the kind of development which results in the formation of a new individual.

EPIGLOTTIS (from *epi*, upon, and *glottis*, the mouth of the windpipe), the cartilage at the root of the tongue forming the lid of the larynx or upper part of the windpipe. Its figure is nearly oval; it is concave posteriorly, and convex anteriorly. Its apex or superior extremity is free, and is always elevated upwards by its own elasticity. When the back of the tongue is drawn backwards in swallowing, the larynx is drawn up under cover of the tongue; and the epiglottis, erect in other circumstances, shuts down over the larynx, thus preventing the entrance of any particle of the food or drink into the windpipe. The base of the epiglottis is fixed to the thyroid cartilage, the os hyoides, and the base of the tongue, by a strong ligament.

EPIGONI, in ancient Greek legend, the collective name of the sons of the seven Greek princes, who conducted the first war against Thebes, without success. The name signifies *after-born*, or *successors*, from *epi*, and *gignesthai*, to be born. See **THEBES**.

EPIGRAM (from *epi*, upon, and *graphein*, to write), originally an inscription, then a poetical inscription in temples, on tombs, &c. The object requires brevity, but admits of all kinds of sentiments and ideas; and it is a great mistake to suppose the epigram always satirical. From its concise and expressive character it is, indeed, well fitted for satire, and often employed for satirical purposes, as it was, likewise, with the Romans; but an epigram may be didactic, satiric, comic, lyric, or elegiac. Lessing, in his *Theory of the Epigram*, says that it is made up of two parts—of an interesting idea and a striking conclusion; but Herder has shown that this is not the essential character of the epigram, though a frequent and agreeable form. It was not, by any means, generally the case with the Greek epigrams. The epigram, with the Romans, flourished most, as was natural, in corrupt times, when satire found most occasion for reproach, and wit took the place of noble ideas. Catullus and Martial were distinguished epigrammatic poets among the Romans. Marot, in the time of Francis I., Piron, J. B. Rousseau, Lebrun, Boileau, and Racine, are distinguished in this department among the French. The most piquant epigrams of the Romans and French are often the most licentious, and offend as much by their indecency as they divert by their ingenuity. The English word as now used implies a certain amount of wit and pungency; the epigram proper being a short piece in verse finishing with a witty or ingenious turn of thought; but a pointed and witty saying in prose may also be called an epigram.

EPIGYNOUS (Greek, *epi*, upon, *gynê*, a female), in botany, is the epithet applied to the outer whorls of a flower, particularly the stamens, to indicate that they are inserted upon the ovary.

EPILEPSY (in Greek, *epilepsis*: from *epilambano*, to seize upon), a nervous disease, depending on various causes, often exceedingly complicated, and incapable of being removed; hence so often an incurable periodical disease, appearing in single paroxysms. Among the different causes may be mentioned hereditary tendency, gastric disturbances either from indigestion or the presence of worms, or some irritation within the skull itself, such as tumours, &c. It is, for the most part, preceded by a cold vapour (*aura epileptica*), creeping up from the foot or hand to the breast and head, or some other premonitory symptom, such as spectral illusions, irascibility, headache, giddiness, confusion of thought, sense of fear, &c.; but sometimes there are no precursive symptoms. The patient suddenly falls, commonly with a cry, some muscles, of eye, face, neck, body, or limbs being thrown into spasm, producing some kind of distortion, complete unconsciousness having occurred. After a few seconds a series of convulsive movements begins, the limbs and head being jerked about, while the mouth twitches, and the eyeballs roll. Meanwhile, owing to the arrest of breathing by spasm, the face becomes swollen and livid. When the breathing begins again it is jerky and noisy. The skin becomes covered with perspiration, and frothy saliva stained with blood, if the tongue has been bitten, as it is apt to be, issues from the mouth, and the contents of bladder and bowel are evacuated. In a minute or two the convulsions cease, the breathing becomes easy, the body becomes flaccid, and consciousness returns. After the cessation of the attack, the person may remain for some time in a dull, half-stupid condition; or a deep sleep may succeed. On awaking from the sleep, or gaining full consciousness, the person usually complains of a feeling of fatigue, and of aching in the body and limbs. During the paroxysm all that is to be attended to is to prevent the patient from injuring himself, to raise the head gently and loosen all tight parts of the dress. It is also advisable to protect the tongue from being bitten by introducing a piece of India-rubber, cork, or soft wood between the teeth. When the convulsions cease, the tongue of the patient should be pulled forward, and his head turned well to one side. Any other treatment is unnecessary and may be hurtful.

EPILOGUE (from the Greek *epi*, and *logos*, word, speech), the closing address to the audience at the end of a play. The epilogue is the opposite of the *prologue*, or opening address. Many of Shakespeare's plays have an epilogue as well as prologue, in which the poet sometimes craves the indulgence of the spectators for the faults of his piece and the performance, and sometimes intimates in what light his work is to be considered. The epilogue is sometimes a necessary appendage, to tell us something of a composition, which cannot be gathered from the composition itself.

EPIMENIDES, a celebrated philosopher and poet of antiquity, who was born in Crete, in the seventh century before Christ, and spent the greater part of his life at Cnossus. By some he is reckoned among the seven wise men, instead of Periander. Most of the stories told of him are mythical. He is represented as favoured with divine communications, and as an infallible prophet. When the Athenians were visited with war and pestilence, and the oracle declared that they had drawn on themselves the divine anger by the profanation of the temple, in which the followers of Cylon had been put to death, and must expiate their offence, they sent for Epimenides, who was

renowned for his wisdom and piety, from Crete, to purify the temple. On his departure he refused to accept any presents, and only asked the friendship of the Athenians on behalf of Cnosus. There is a story of his having, when a boy, slept in a cavern for fifty-seven years. On awakening, he found, to his astonishment, everything changed in his native town. This story is the ground-work of Goethe's poem, the *Waking of Epimeneides*, for the anniversary of the battle of Leipzig. According to some accounts he is said to have lived for upwards of 150, according to others for nearly 300 years. He is supposed to be the prophet referred to by St. Paul in Titus, ch. 1. 12.

EPIMETHEUS, in Greek mythology, a son of Iapetus and Clymene, and the brother of Prometheus, against whose advice he married Pandora, who opened the box in which the foresight of Prometheus had hid all the ills by which mortals were liable to be afflicted. All kinds of diseases and torments issued out of the box, and hope alone remained behind. According to other accounts it was Epimetheus himself who opened the box. (See *PANDORA*.) It is to be remarked that, in the Greek tradition, curiosity and disobedience are made the origin of evil, as in the Mosaic account of the fall.

ÉPINAL, a town, France, in a narrow valley on the Moselle, 190 miles E.S.E. of Paris. It was once the capital of a duchy in Lorraine, is still capital of department Vosges, and consists of three distinct parts—the Grande Ville on the right bank, the Petite Ville on an island formed by the river and a canal, and the Faubourg des Capuchins on the left bank. It is well built, consisting of spacious and clean though badly-paved streets, and has handsome quays, an ancient Gothic church, a communal college, a public library of 20,000 vols., a museum, a theatre, an hospital, and the ruins of an old castle, seated on a commanding height. The manufactures consist of articles in iron and brass, cutlery, earthenware, leather, oil, and chemicals, and both freestone and marble are largely quarried in the vicinity. Pop. (1896), 18,580.

ÉPINAY, LOUISE FLORENCE PÉTRONELLE, MADAME D', born in 1725. This accomplished lady, celebrated for her connection with Rousseau, was the daughter of M. Tardieu Desclavelles, who lost his life in Flanders, in the service of Louis XV., and left his family in very moderate circumstances. She married her cousin D'Épinay, son of M. Delalive de Bellegarde, who received the office of farmer-general. But the extravagance of the young man soon disturbed the happiness which had been expected from this union, and compelled her to separate from him. During the earlier part of her life she formed an acquaintance with the philosopher of Geneva, who, quick and susceptible in all his feelings, devoted himself to the fascinating and accomplished woman with an ardour, the depth and strength of which he describes himself in his Confessions. She was not insensible to the homage of her *dear*, as she used to call him, on account of his eccentricities. She did all that was in her power to place him in a situation corresponding to his wishes. She gave him a cottage (the Hermitage, since so famous) in her park of Chèvrette, in the vale of Montmorency. Here the author of the *Nouvelle Héloïse* passed many days, rendered happy by his romantic attachment to Madame d'Épinay; until he became jealous of Baron Grimm, whom he had himself introduced to his mistress; and in consequence of this feeling, which he took no pains to conceal, a coolness, and finally an aversion, took place between him and the lady, which is but too plainly expressed in his Confessions. A defence of the later conduct of Madame d'Épinay

towards Rousseau may be found in Grimm's Correspondence, where an account is also given of some works written by her, of which the most celebrated is *Les Conversations d'Émilie*. In this the authoress, in a rather cold, but neat style, sets forth the principles of moral instruction for children, with equal elegance and depth of thought. It obtained, in 1783, the prize offered by Monthlon (the chancellor to the Count d'Artois) for useful works of this kind, in preference to the *Adèle et Théodore* of Madame de Genlis. She also wrote *Lettres à mon Fils*, and *Mes Moments heureux*. An abridgment of her highly interesting memoirs, and her correspondence, showing her relations with Duclos, Rousseau, Grimm, Holbach, Lambert, &c., appeared in Paris in three vols., in 1818. They give a true picture of the refined but corrupt manners which prevailed among the higher classes in France during the government of Louis XV. Madame d'Épinay died in 1783.

EPIPHANUS, St., Bishop of Constantia, was born in Palestine about 310. He was of a Jewish family. Affected by the religious enthusiasm of the period, he retired to a solitude near Eleutheropolis, his native town, where he founded a monastery. From this retreat he was dragged against his will about 367, to be consecrated Bishop of Salamis or Constantia, in Cyprus. He was well versed in the Scriptures, and in the eastern and classical languages. He was a zealous and unsparing denouncer of heresy, and in this capacity he combated the opinions of Arius and Origen. In his work *Panarion*, or the Antidote against Heresies, he gives the history, together with the refutation, of a great number of heresies. He died on a journey from Constantinople to Cyprus, in the winter of 402-3. His festival is on the 12th of May.

EPIPHANY (Greek, *epiphaneia*, from *epiphaino*, to show forth), or *TWELFTH-DAY*, a festival, otherwise called the *manifestation of Christ to the Gentiles*, observed on the 6th of January, in honour of the manifestation which led to the visit of the three magi, or wise men, who came to adore the infant Christ and bring him presents. Epiphany is called by the Greeks the *feast of lights*, because Christ is said to have been baptized on this day, and baptism is by them called *illumination*. It is called in Germany the *feast of the three holy kings*. See *TWELFTH-DAY*.

EPIPHYTES (Greek *epi*, upon, *phyton*, a plant), plants which grow and flourish upon the trunks and branches of trees, adhering to the bark, as various flowering plants, mosses, lichens, ferns, &c. The term is not generally applied to parasites, which, like the mistletoe, derive nourishment from their host. Many tropical orchids are epiphytes.

EPIRUS (Greek, *Epeiros*), the most southerly part of modern Albania; a province bordering on Greece, and sometimes included in it; though not inhabited by the Hellenic race. The name was originally given to the whole of Western Greece, as far as Corinth. Epirus proper is a wild and mountainous country, and has always been the abode of robbers. The mountains run north and south, interspersed with numerous but limited valleys. The most extensive plain is the Joannina or Jannina, in which was probably situated the oracle of Dodona, the most ancient in Greece. There are no traces remaining of that celebrated city, nor has the grove of oaks, with the never-falling fountains, been yet discovered. Mythology probably derived from this country the infernal rivers of Acheron and Cocytus; and here, too, the poisonous vapours exhaled from Avernus (now called *Vall dell' Orso*). The number of Epirot tribes in early times was fourteen; the Chaonians were the most powerful. The ancient inhabitants are supposed to have

EPIPHYTES



WEST IND. NO. 1

been of Pelasgian origin. Several Greek colonies settled among them. Each tribe was originally ruled by a separate king; but the Molossians at last acquired the ascendancy, and the kings of this tribe took the name of kings of Epirus. The most celebrated of the kings of Epirus was Pyrrhus, who made war upon the Romans. Being delivered from the Macedonian yoke by the Romans, when they conquered Philip II., the Epirotes gradually became so powerful that they assisted Antiochus and Perseus against the Romans, but thereby only hastened their own downfall. Paulus Æmilius subdued them, and gave up their towns to pillage. Seventy towns were destroyed, and 150,000 men sold into slavery. Epirus, from this time, shared the fortunes of the Roman Empire, till it was conquered by the Turks. After the capture of Constantinople by the Crusaders in 1204, a branch of the imperial family of Comnenus established itself in Epirus, which it ruled for upwards (in 1467) of two centuries. This dynasty is known as the *despots of Albania*. Its last representative, George Castriota (Scanderbeg), was given by his father as a hostage to Amurath II., who occupied Albania in 1432. Castriota contrived to regain possession of his principality, and throw off the Turkish yoke, which he successfully resisted till his death in 1467, after which the country again fell under the Turkish dominion.

EPISCOPACY, the system of church government by bishops and archbishops. See **BISHOP**.

EPISODE (Latin, *episodum*, from the Greek *episodion*, something adventitious) is employed by Aristotle in two significations. Sometimes it denotes those parts of a play which are between the choruses, and sometimes an incidental narrative, or digression in a poem, which the poet has connected with the main plot, but which is not essential to it. In modern times it has been used in the latter sense only. With the best poets the episode is not a mere patch or piece to fill out the poem, not an unnecessary appendage, serving merely to swell the size of the work, but it is closely connected with the subject, points out important consequences, or develops hidden causes. Of this kind is the narrative of the destruction of Troy, in Virgil's *Æneid*. This was the cause of the hero's leaving his country, and wandering over the sea; but the poet does not commence with it because he wishes to bring the plot into a narrower space, in order to make it more distinct and lively. He therefore inserts it in the course of the story, but so skillfully that we expect it in this very place; and it not only serves as a key to what has gone before, but prepares us for what is to come, viz. the passion of Dido. In this way the episode becomes an essential part of the whole, as it must necessarily be, if it is of any importance to preserve the unity of the poem. So with the tale in Wieland's *Oberon*; it appears incidental, but explains to us the reason of Oberon's singular interest in the fate of Huon. In epic poetry there is much more room for the episode than in dramatic, where the poem is confined to a present action. The term *episode* has also been transferred to painting, especially historic painting, in a sense analogous to that which it has in poetry. A beautiful instance of the skillful use of the episode in the modern novel is given in Manzoni's *I promessi sposi*, in the tale of the Nun of Monza.

EPISTOLÆ OBSCURORUM VIRORUM (Letters of Obscure Men), a series of letters arising out of a literary controversy which immediately preceded the Reformation in Germany. The revival of ancient learning was prosecuted in Germany with great zeal by a small band of scholars, who were violently opposed by their advocacy of a reform of learning by the university and ecclesiastical authorities. Among

the advocates of learning, one of the most distinguished was Reuchlin, who, in the course of a controversy on the introduction of Hebrew literature, was accused by the theologians of Cologne of blasphemy and other crimes against religion. This controversy proceeded to such an extent that it was repeatedly appealed to the pope. Reuchlin had published a series of letters addressed to him under the title of *Epistolæ Illustrum Virorum ad Reuchlinum*, and it was apparently in imitation of this title that the formidable satire *Epistolæ Obscurorum Virorum ad Venerabilem Virum Magistrum Ortuinum Gratium* took its name. Ortuinus, it may be explained, was the chief opponent of Reuchlin. The satire was written in what was called kitchen or monkish Latin. The letters were supposed to be addressed to Ortuinus by clergymen and professors in the Rhine districts, particularly of Cologne, all belonging to the obscure party, the party opposed to learning and progress, who are made, in the most innocent way, to expose their own ignorance, profanity, and licentiousness. The work is unsparing, and probably not always fair in its satire; but it seems not to have been overdone, as many of the party it was intended to ridicule took it at first for a serious production, and applauded its advocacy of their views. The same mistake as to its origin has since been made, even by scholars. It is still considered as one of the most masterly sarcasms in the history of literature, and its importance is enhanced by the effect it had in promoting the cause of the Reformation, which was justly acknowledged by Luther. The first volume appeared in 1515, the second in 1517. In the latter year it was condemned by the pope. The authorship of this satire has been a fertile subject of controversy, and is yet apparently far from being settled. Sir Wm. Hamilton (see his article on the *Epistolæ* in the *Discussions on Philology*, &c.) attributed it to Hutten, Croten, and Buschius. Later authorities do not appear to have adopted his view. The latest edition of the *Epistolæ* is by Böcking (Leipzig, 1858).

EPISTYLIIUM. See **ARCHITECTURE**.

EPITAPH (from the Greek *epitaphion*, from *epi*, upon, and *taphos*, tomb), an inscription upon a tomb. Epitaphs were in use both among the Greeks and Romans. The tombs of the Romans were placed near the highways, and their epitaphs commonly commenced with, *Sic viator!* (Stop, traveller!) The Greeks distinguished by epitaphs only their illustrious men. Among the Romans they became a family institution, and private names were regularly recorded upon tombstones. The same practice has generally prevailed in Christian countries. On Christian tombstones, epitaphs are usually, in addition to any record of the virtues of the departed, used as a medium for expressing the pious hopes of survivors in reference to the resurrection or other doctrines of the Christian faith, of conveying moral lessons on the brevity of life, &c. In the catacombs of Rome, which were made a place of refuge by the persecuted Christians under the pagan emperors, there are many remarkable epitaphs of this description.

The epitaph, says Oxenstiern, is the last of human vanities. It would be desirable, says Marmontel, that every man should write his epitaph early in life; that he should make it as flattering as possible; and that he should spend his life in trying to deserve it.

We will here give a few examples of memorable epitaphs. One of the happiest is that of Sir Christopher Wren, in St. Paul's, London, of which he was the architect:—

Si monumentum quaeris, circumspice.

'If you ask for his monument,—look around.'

The following is the epitaph of a Roman matron:—

*Domum mansit
Lanum fecit.*

'She kept the house and spun wool.'

Sta, viator: heroum calcos

has been ascribed both to Montecuculi and to General Mercel. Epitaph on Alexander the Great:—

Sufficit huic tumulus, cui non suffecerat orbis.

'This tomb suffices for him for whom the world did not suffice.'

Count Tessin, governor of Gustavus III. of Sweden, ordered the words—

*Tandem felix—
'Happy at last,'*

to be inscribed on his tomb. The following is Sir Isaac Newton's epitaph:—

*Isaacum Newton,
Quem immortalẽm
Testantur Tempus, Natura, Calum,
Mortalem hoc Marmor
Fateatur.*

'This marble acknowledges Isaac Newton mortal, to whose immortality time, nature, and heaven bear witness.'

St. Anne's Church, at Cracow, has the following suggestive epitaph, dedicated by Count Sierakowski to Copernicus:—

*Sta, sol, ne moveare.
Staud, O sun! move not.*

The quaint humour of Dr. Franklin expressed itself in the following lines:—

*The body
of
Benjamin Franklin
printer
(like the cover of an old book,
its contents torn out,
and stripped of its lettering and gilding),
lies here, food for worms;
yet the work itself shall not be lost,
for it will (as he believed) appear once more
in a new
and more beautiful edition,
corrected and amended
by
the Author.*

In humorous and witty epitaphs the French are peculiarly happy. Take, for instance, the following on Piron, by himself:—

*Ci-gît Piron qui ne fut rien,
Pas même académicien.*

'Here lies Piron, who was nothing—not even a member of the Academy.'

It is not necessary to say against whom the irony is directed. Another of Piron's contains a specimen of irony still more concentrated and crushing. On Marshal de Belle-Isle, buried at St. Denis, beside Turenne:—

*Ci-gît le glorieux à côté de la gloire.
'Here lies the (vain) glorious beside glory.'*

The following, by La Mannoys, was a competitive epitaph, on a rich man, for 300 francs:—

*Ci-gît un très grand personnage,
Qui fut d'un illustre lignage,
Qui posséda mille vertus,
Qui ne trompa jamais, qui fut toujours sage;
Je n'en dirais pas davantage,
C'est trop mentir pour cent écus.*

'Here lies a very distinguished man, who was of an illustrious lineage, and was possessed of a thousand virtues: he never deceived; he always acted wisely. I shall say no more, it is too many lies to tell for a hundred crowns.'

On Robespierre:—

*Pasant ne pleure pas ma mort:
Si je vivais tu serais mort.*

*Passenger, do not weep for me; if I lived, dead you would be.'

There are few examples of a style of epitaph which is among the highest of all; but there are only a few names which can thus be distinguished. The tomb of Masséna bears one word only, on an elevated monument:—

MASSÉNA.

EPITHALAMUM (from *epi*, and *thalamos*, a chamber), a nuptial song. Among the Greeks and Romans it was sung by young men and maids at the door of the bridal chamber of a new-married couple. It was accompanied with shouting and stamping with the feet. It consisted of praises of the bridegroom and bride, with wishes for their happiness. Among the Romans the husband scattered nuts among the young men at the same time. Examples may be seen in Theocritus' epithalamium of Helen, and the epithalamium of Catullus.

EPITOME (from the Greek *epitomē*, from *epi*, and *temnō*, I cut), an abridgment, an abbreviation, or compendious abstract.

EPOCH, or ERA, is a fixed point of time, commonly selected on account of some remarkable event by which it has been distinguished, and which is made the beginning or determining point of a particular year from which all other years, whether preceding or ensuing, are computed. As there is no astronomical consideration which dictates the choice of one epoch rather than another the choice is arbitrary, and being, as has been observed, usually determined by the opinion which particular peoples in various ages have had of particular events, the number of epochs which have acquired historical importance is rather considerable, and the difficulty which has arisen in harmonizing the dates of events recorded by different observers in various times and countries using all this variety of epochs has also been considerable. This difficulty, it will be seen, consists of two distinct elements proceeding from two different sources. There is first the mere difficulty of reconciling modes of enumeration which have not the same starting-point. What makes this difficulty at all perplexing is that the various epochs not only begin with different years, but these various starting-points are not all reckoned from the same period of the year; and even in using the same epoch for a protracted period of time, the day fixed for the commencement of the year has occasionally been changed, so that in transferring dates from one epoch to another it is necessary to know accurately the time of the commencement of the year in each. The other element of complication is much the more serious one. Not only the commencement but the duration of the year varies in the different styles of reckoning, and here again the practice of each particular style is not constant throughout the period of its use. Sometimes the lunar year is founded on, sometimes the solar, sometimes a changeable year founded on an accommodation between the two. The solar year, as is well known, does not consist of an exact number of days, hence even when it is founded on exclusively, an adjustment, such as our leap-years, is necessary to make the commencement of the year always recur at the same season. As each of the various styles which have been in use at various times, or simultaneously in different places, has its own mode of adjustment, some more and some less accurate, it will easily be seen how much this complicates the reconciliation of dates. We shall here briefly enumerate the more important historical epochs, with such particulars as may enable the reader with general accuracy to bring them into correspondence with that in common use. For further details on the mode of reckoning see CALENDAR.

The Creation.—The biblical record of the creation has formed the foundation of numerous chronologies. Of course the authorities (Jewish and Christian) on

these various modes of reckoning do not agree as to the time signified by the common authority for the event founded on. The more important of these epochs, of which there are about 140 different varieties, are—

1. The epoch adopted by Bossuet, Ussher, and other Catholic and Protestant divines, which places the creation in B.C. 4004. 2. The *Era of Constantinople* (adopted by Russia), B.C. 5508. The civil year begins 1st September, the ecclesiastical year about the end of March. 3. The *Era of Antioch*, used till A.D. 284, placed the creation B.C. 5502. It was merged in the following year in—4. The *Era of Alexandria*, which made the creation B.C. 5492. This is also the *Abyssinian Era*. 5. *Jewish Era*. The common era of the Jews places the creation in B.C. 3760. Their year is lunar-solar, that is lunar with intercalary months, forming a cycle of 19 years, of which 12 have 12 months and 7, 13 months. The year thus varies from 353 to 355 days. The civil year begins with the new moon following the autumn equinox. The eras dating from the creation are distinguished by the initials A.M. Const., Abyssa, &c., are sometimes added to distinguish the particular epochs.

The *Julian Period* commences B.C. 4713. It is an arbitrary epoch, fixed for the purpose of computing all dates forward, as in the case of the creation epochs.

The *Olympiads*.—The Greeks computed their time by periods of four years, called Olympiads. Their year was lunar, with intercalary months. (See CALENDAR.) The first Olympiad, being the year in which Corvbus was victor in the Olympic games, was in the year B.C. 776. The period of the commencement of the year, which was variable, was about July. The contraction used for the Olympic epoch is Olymp.

The *Roman Era* (Ab Urbe Condita).—The Romans dated from the supposed era of the foundation of their city, the 21st of April, in the third year of the sixth Olympiad, or B.C. 753 (according to some authorities B.C. 752). This epoch is designated by the initials A. U. C. The Roman mode of computation was the foundation of our modern chronology. See CALENDAR.

The *Sæcudes* commences B.C. 1st October, 812, the epoch when Seleucus I. (Nicator) took possession of Babylon. The year consisted of 365 days, with a leap-year every fourth year. This era is used in the book of Maccabees.

The *Spanish Era* is reckoned from B.C. 1st January, 38. The months and days were the same as those of the Julian calendar. It was disused in Arragon in 1350; in Valencia 1358; in Castile 1383; in Portugal about 1415.

The *Christian Era*, or mode of computing from supposed date of the birth of Christ, was first introduced in the sixth century, and did not become popular and general for a considerable time afterwards. It had been generally adopted by the year 1000. Since the first year of the first century was A.D. 1, the last year of the same century was A.D. 100. Similarly the year A.D. 1900 was the last year of the nineteenth century. The same holds good in reckoning backwards. For particulars of the mode of reckoning the years of the Christian era, and the changes which it has undergone, see CALENDAR.

Armenian Era commenced 7th July, 552, and was superseded by the Julian era about 1330. The year consisted of only 365 days.

The *Mohammedan Era*, or *Hegira*, commences on 16th July, 622. The conversion of the Mohammedan into Christian chronology causes more difficulty and confusion than arises with any of the other modes of reckoning. The Mohammedan year is purely lunar. It consists of 12 months, and each month commences

with the appearance of the new moon. Hence their years have no correspondence with the recurrence of the seasons, and to know the period when a Mohammedan year begins it must be reckoned from the beginning of the era. In chronology, history, &c., they use months of 29 and 30 days alternately, making the year consist of 354 days. Eleven times in 30 years 1 day is added to the last month, making 355 days in the year. The mean length of the year is thus $354\frac{11}{30}$ days, of the month $29\frac{11}{30}$, differing from the true lunation by little more than 3 seconds, or less than a day in 2260 years. As 33 Mohammedan years amount to only 6 days (including intercalary days and leap-years) more than 32 of our years, by deducting 1 year from each 33 Mohammedan years, and adding $62\frac{1}{3}$ years, the year of the Christian era will approximately be found. The Hegira is distinguished by the initials A.H.

Persian Era (era of Yezdegerd III.) began 16th July, 632. The year consisted of 365 days. It was reformed in 1075 by the addition of a day whenever it was necessary to make the commencement of the year occur on the day of the sun's passing the same degree of the ecliptic. The months have each 30 days, with 5 or 6 days intercalated. This era is still used by the Parsees in India.

Indian Chronology.—The natives of India use a great variety of epochs, some of which are but little understood even by themselves, and almost all are deficient in universality and uniformity, so that the same epoch, nominally, will be found to vary many days, or even a year, in different provinces. The solar, or more properly the sidereal year, is that which is most in use for public business, particularly since the introduction of European power into India. This year is calculated somewhat differently by Indian astronomers from the European reckoning, so that there is about a day more in sixty years by the Indian chronology than by ours. The luni-solar computation, though less prevalent than formerly, is still used in many parts of India, particularly in regard to religious observances, as the regulation of festivals, and in domestic life. The luni-solar mode varies in different provinces, some beginning the month at full moon, others at new moon. There are other matters which render the computation of the Hindu luni-solar year so complicated that it cannot be accurately known without an acquaintance with Hindu astronomy.

The best known eras computed by solar time are the *Kaliyuga*, which dates from 3101 years before Christ, and the *Salvrahana* from A.D. 77. Both are computed astronomically, losing 1 day in 60 years by our computation. The era of *Vikramaditya*, beginning 57 years B.C., is computed by lunar months, with intercalations made according to astronomical observation, and bringing the year up to 365 or 366 days. The *Bengali* year was formerly identical with the Hegira, but is now reckoned by solar computation.

The *Chinese*, like all the nations of the north-east of Asia, reckon their time by cycles of 60 years. Instead of numbering them as we do, they give a different name to every year in the cycle. As all those nations follow the same system, we shall detail it here more particularly. They have two series of words, one of ten, and the other of twelve words; a combination of the first words in both orders is the name of the first year; the next in each series are taken for the second year; and so to the tenth: in the eleventh year, the series of ten being exhausted, they begin again with the first, combining it with the eleventh of the second series; in the twelfth year, the second word of the first series is combined with the twelfth of the second; for the thirteenth year, the

combination of the third word of the first list with the first of the second list is taken, that list also being now exhausted. To make this clearer, we shall designate the series of ten by the Roman letters, that of twelve by the italics, and the whole cycle of 60 will stand thus:—

1 a	16 f d	31 a g	46 f k
2 b b	17 g e	32 b h	47 g l
3 c c	18 h f	33 c i	48 h m
4 d d	19 i g	34 d k	49 i n
5 e e	20 k h	35 e l	50 k o
6 f f	21 a i	36 f m	51 a c
7 g g	22 b k	37 g n	52 b d
8 h h	23 c l	38 h o	53 c e
9 i i	24 d m	39 i p	54 d f
10 k k	25 e a	40 k d	55 e g
11 a l	26 f b	41 a e	56 f h
12 b m	27 g c	42 b f	57 g i
13 c n	28 h d	43 c p	58 h k
14 d o	29 i e	44 d h	59 i l
15 e c	30 k r	45 e i	60 k m

The series of 10 is designated in China by the name of *ten kan*, or celestial signs. The Chinese months are lunar, of 29 and 30 days each. Their years have ordinarily 12 months, but a 13th is added whenever there are two new moons while the sun is in one sign of the zodiac. This will occur seven times in nineteen years. The boasted knowledge of the Chinese in astronomy has not been sufficient to enable them to compute their time correctly. In 1290 A.D. the Arab Jemaledin composed a calendar for them, which remained in use until the time of the Jesuit Adam Schaal, who was the director of their calendar until 1664. It then remained for five years in the hands of the natives, who so deranged it, that, when it was again submitted to the direction of the Christians, it was found necessary to expunge a month to bring the commencement of the year to the proper season. It has since that time been almost constantly under the care of Christians. The first cycle, according to the Romish missionaries, began February, 2397 B.C. To find out the Chinese time, multiply the elapsed cycle by 60, and add the odd years; then, if the time be before Christ, subtract the sum from 2398; but if after Christ, subtract 2397 from it; the remainder will be the year required.

The Japanese have a cycle of 60 years, like that of the Chinese, formed by a combination of words of two series. The series of ten is formed of the names of the elements, of which the Japanese reckon five, doubled by the addition of the masculine and feminine endings *je* and *to*.

The natives of America, previous to its discovery by Europeans, particularly the Peruvians and Mexicans, appear to have had a considerable acquaintance with astronomy, and to have reckoned their time with great care. The Mexican year consisted of 365 days, composed of 18 months of 20 days, and 5 added days. At the end of a cycle of 52 years 12 and 13 days were added alternately, making the mean year very near the truth.

EPOCH, in geology, has now a very different meaning from that which it formerly had. Instead of corresponding to a period in the history of the earth, it answers to a period in the history of a particular locality. Epochs are determined by the occurrence of particular kinds of animal and vegetable life in a group of strata which are marked off by unconformity above and below; the rocks were deposited and the organisms lived in that locality between the two great geographical changes, one of which preceded the earliest deposit of the particular group of rocks, while the other closed the series. The conformably sequent strata of this series belong to one epoch; but the dissimilar animals and plants which lived elsewhere at the same time were either not preserved at all in deposits, or were entombed in

deposits of a different kind. In the latter case the assemblage would represent an epoch for that particular locality. Thus the Old Red Sandstone and the Devonian strata, the former lacustrine, the latter marine, were probably identical in epoch as they were contiguous in area. The Wealden epoch in England was anterior to that of the Chalk, if judged by the superposition of the strata and the difference of the fossils. But the Wealden land was the continent of an ocean, the cretaceous, of which the Atlantic at the present time is the direct successor. The Wealden epoch in Britain was short, judged by the succession of deposits, but we know it to have been longer than that of the cretaceous in the west of Europe. If we imagine the floors of the German Ocean and the Australian seas, just as they now are, to be covered by thick deposits of strata, these strata would, judged by their fossil contents, belong to different epochs: but we know that they only belong to different zoological provinces. Natural groups of strata represent, therefore, the epochs during which the animals and plants they contain lived and died in a particular area, and where a closely similar assemblage is found in strata at a distant locality we have therefore proof that during an epoch of unknown length similar organisms flourished there; but the epoch may have been before, identical with, or later than that first studied. Epoch is thus a term of only local application, and the proof that, though the assemblage of rocks may be a natural one for one locality, it is not so for a great area, is found in the fact that the unconformities which indicate great geographical change do not occur at identical points everywhere. Thus the Silurian and Old Red formations are conformable in England, unconformable in Scotland, and unconformities in both series are differently placed in America. Whether or not any epoch ever existed in the earlier sense of the term, whether, in other words, the life over the whole surface of the earth was at any one time alike, we cannot tell. The probability is that no such period ever existed, and that therefore the phenomena which represent an epoch are the record of local geographical events, and of a local fauna and flora.

EPODE (from the Greek *epodos*), the last division in the choral song of the ancients, which was sung when the chorus, after the strophe and antistrophe, had returned to its place (see CHORUS); so that it was a kind of closing song, or finale. This epode had a peculiar measure, and an arbitrary number of verses. By the term *epode* is also understood a sort of satirical ode; according to Hephaestion, one which has longer and shorter iambic verses, following each other alternately. Horace has a book of epodes of this kind.

EPPING, a market town of England, in Essex, giving name to a parl. div., 17 miles from London, and in the midst of the forest to which it gives name. This ancient royal forest, still extending to 5600 acres, presents some fine woodland scenery, and is a favourite resort of holiday-makers. It has been secured to the nation by legislative enactment, and was opened by the Queen in 1882 as a public recreation ground. The town consists of a single broad street on a ridge of hills. Pop. (1901), 3788.

EPROUVETTE, the name of an instrument for ascertaining the strength of gunpowder, or of comparing the strength of different kinds of gunpowder. One of the best, for the proof of powder in artillery, is that contrived by Dr. Hutton. It consists of a small brass gun, about 2½ feet long, suspended by a metallic stem, or rod, turning by an axle on a firm and strong frame, by means of which the piece oscillates in a circular arc. A little below the axle the stem divides into two branches, reaching down to the

gun, to which the lower ends of the branches are fixed, the one near the muzzle, the other near the breech of the piece. The piece is charged with a small quantity of powder (usually about 2 ounces) without any ball, and then fired; by the force of the explosion the piece is made to recoil or vibrate, describing an arc or angle, which will be greater or less according to the quantity or strength of the powder. The hand epruvette is an instrument in the form of a very short pistol. The barrel or powder-chamber is closed by a plate communicating with a strong spring. On the explosion the plate is driven back to a greater or less distance according to the strength of the powder, and is retained at the extreme distance by a ratchet-wheel.

EPSOM, a town in the county of Surrey, England, 15 miles south-west of London. Epsom was formerly celebrated for a mineral spring, from the water of which the well-known Epsom salts were manufactured. It is a scattered, irregularly-built place. The chief buildings are the public hall, the Royal Medical Benevolent College, and several churches. The principal attraction Epsom can now boast of is the grand race-meeting held on the Downs, which is attended by hundreds of thousands of persons. The races begin on Tuesday, and continue to the end of the week preceding Whitsuntide; the Derby stakes are run for on Wednesday, which is the principal day, and the Oaks on Friday. There is also racing on two days earlier in the season; the town being otherwise characterized as 'a dull little place for fifty weeks in the year' Epsom gives name to one of the parliamentary divisions of the county. Pop. (1891), 8417; (1901), 10,915.

EPSOM SALTS, or EPSOMITE, sulphate of magnesium ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$), appears in capillary fibres or acicular crystals, and it also occurs in a loose, mealy powder; its colour is white, grayish, or yellowish; it is transparent, or translucent, with a saltish, bitter taste. It is soluble in its own weight of cold water, and effloresces on exposure to the air. It occurs at Montmartre, in Spain, in Chili, and in the Kentucky Mammoth Caves. Most of the commercial salt is, however, manufactured from *kieserite* ($\text{MgSO}_4 \cdot \text{H}_2\text{O}$), which occurs in the salt-beds of Staßfurt. It is used in medicine as a purgative, and in the cotton manufacture for warp-sizing. Dyers also use considerable amounts of it. The English name is derived from the circumstance of its having been first procured from the mineral waters at Epsom. See MAGNESIUM.

EQUATION, in mathematics, the statement in symbols of the equality of two or other mathematical expressions. The assertion of equality is made by writing the sign = (read 'is equal to' or 'equals') between the expressions. Thus: $5x + 7 = 32$, and $ax^2 + bx + c = 0$, are equations, each of which indicates the equality of the quantity written on the left of the sign (=) to that written on the right of the sign. Usually the object of writing down an algebraic equation is to express in symbols known relations between given and unknown quantities, so that by algebraic processes the latter may be determined in terms of the former. For example, the first of the equations displayed above is the algebraic expression of the following problem:—Find a number such that if it be multiplied by 5, and 7 added to the product, the sum shall be 32. The symbol x there represents the unknown number; it is shown in the equation multiplied by 5, and the product is connected by the sign (+), which signifies addition, with the number 7, and on the right-hand side of the sign (=) is written 32, the number to which by the conditions of the problem the sum above mentioned is equal.

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Unknown quantities are generally represented by the last few letters of the alphabet, x, y, z , and sometimes some of the others; and the different sorts of equations are named from the forms in which the unknown quantities appear. Thus equations are said to be of the *first, second, third, &c., degree*, according as the highest power of the unknown quantity involved is the first, second, third, &c. $ax + b = c$ is of the first degree; $ax^2 + bx = c$ is of the second degree; $ax^2 = c - b$ is an equation of the third degree. An equation of the n th degree has n roots, and is not completely solved till all are found; of these roots, however, an even number may be imaginary. Equations of the first and second degrees are very easy of solution, but no general method can be given for those of the fifth and higher degrees. Again, there are trigonometrical equations, which contain such trigonometrical functions, as they are called, of the unknown quantity, as $\sin x$, $\cos y$; and transcendental equations which contain such functions as $\log x$, e^x . These are, however, not generally discussed in the great and most important branch of algebra technically called *theory of equations*. *Identical equations or identities* are questions which are true whatever be the values assigned to the symbols involved. Some identities are of very great importance in mathematics, for example, $a^2 - b^2 = (a + b)(a - b)$.

EQUATION, in astronomy, any quantity to be added to or subtracted from the mean motion of any heavenly body, in order to determine its true place at any given time. Thus we have the equation of the centre, a quantity to be added to or subtracted from the anomaly, in order to determine the true position of a heavenly body. For instance: let the curve EOF represent the earth's orbit (which is an ellipse), EF the line of the apses, and A the position of the sun. When the earth is in any position as C , the line AC drawn from the sun to the planet is the radius vector, then will the angle CAF be the anomaly, or the angular distance from the perihelion. Were the earth's motion uniform the increase or decrease of this angle would be equal in equal times, and the mean anomaly would be the true anomaly; but the earth's motion is retarded as it advances from F to C , is slowest at x , and is accelerated from that point, the aphelion, through the other half of its orbit till it arrives at F , the perihelion. The quantity to be added to the mean angular motion, during one portion of the orbit, or subtracted from it in the other, in order to find the true anomaly, is called the equation of the centre.

EQUATION, in chemistry, is a collection of symbols to denote that two or more definite bodies—simple or compound—have been brought within the sphere of chemical action, that a reaction has taken place, and that new bodies are produced. It is called an equation, because the total weight of the substances concerned remains the same. An equation is possible, therefore, only where it is known what has happened to all the bodies, or when all the matter has been accounted for. On the other hand, an equation is not necessarily correct because the weight of the bodies on the two sides is equal: the bodies must be represented as in proper combination with each other. An equation therefore denotes not merely equality of weight but the result of a chemical action, and it is nothing else than the expression in brief of the result of a chemical investigation. Nothing can be predicted from the mere weights of the substances what will take place chemically, and it is only after this has been determined experimentally

that the equation representing the distribution of the weights of the bodies concerned can be calculated and written out symbolically.

EQUATION, PERSONAL. In astronomical observations depending on time, for example in observing the time of passage of a star across the middle wire of the transit instrument, it is found that two observers always assign slightly different instants for that of the occurrence of the event. One observer is found always to record it as happening a little sooner than the right time, another always a little later. With skilled observers this error is found to be nearly constant. The correction applied for it is called the *personal equation*.

EQUATION OF TIME, in astronomy, denotes the difference between mean and apparent time, or the reduction of the apparent unequal time, or motion of the sun or a planet, to equable and mean time or motion. If the earth had only a diurnal motion, without an annual, any given meridian would revolve from the sun to the sun again in the same space of time as from any star to the same star again, because the sun would never change his place with respect to the stars. But as the earth advances almost a degree in its orbit in the time that it turns eastward round its axis, whatever star passes over the meridian on any day with the sun, will pass over the same meridian on the next day, when the sun is almost a degree short of it, that is 3 minutes 56 seconds sooner. If the year contained only 360 days, as the ecliptic does 360°, and the sun's motion were equable, his apparent place would change a degree every day, and then the sidereal days would be 4 minutes shorter than the solar. The mean and apparent solar days are never equal except when the sun's daily motion in right ascension is 59"; which is nearly the case about the 15th of April, the 15th of June, the 1st of September, and 24th of December, when the equation is zero; and it is at its greatest about the 1st of November, when it is 16 minutes 14 seconds.

EQUATOR. By the celestial equator is understood that imaginary great circle in the heavens, the plane of which is perpendicular to the axis of the earth; it is everywhere 90° distant from the celestial poles, which coincide with the extremities of the earth's axis, supposed to be produced to meet the heavens, and its axis is this produced axis. It divides the celestial sphere into the northern and southern hemispheres. During his apparent yearly course the sun is twice in the equator, at the beginning of spring and of autumn. (See EQUINOX and DAY.) Then the day and night are equal—whence the name of *equinox*. The situation of the stars, with respect to the equator, is determined by their declination and right ascension (which see). The terrestrial equator, called by mariners simply the *line*, is that great circle of our globe, every point of which is 90° from the poles, which are also its poles, and its axis is the axis of the earth. It is in the plane of the celestial equator. All places which are on it have invariably equal days and nights. (See DAY.) Our earth is divided by it into the northern and southern hemispheres. From this circle is reckoned the latitude of places, both north and south. See LATITUDE.

EQUATORIAL. The telescope used in observatories for searching the heavens. Other instruments, the transit instrument and the mural circle, are only used for stars that are crossing the meridian. The equatorial is movable about two mutually perpendicular axes, one of which points to the pole of the heavens. It can be moved so as to point in any required direction, and on account of one of the axes round which it turns pointing to the celestial pole, it follows a star by means of a single motion.

EQUERRY, in Britain, an officer of state under the master of the horse. There are six equerries, who ride abroad with the sovereign; for which purpose they give their attendance monthly, one at a time. The *clerk-marshal*, as the chief equerry is styled, has a salary of £500 per annum, and the equerries in ordinary have £300.

EQUESTRIAN ORDER, the order of 'Knights' in ancient Rome. The *equites* or knights did not at first form a distinct order in the state, but were merely selected, 100 from each of the three tribes, as the body-guard of the king. Their number was afterwards increased; but when the equites became a distinct order, or class, is not known with certainty; it was probably soon after the expulsion of the kings. None but those who were named by the censor belonged to the order of equites; they were taken from plebeian or patrician families, and those who were of illustrious descent were called *illustres*, *speciosi*, &c. Their number was not fixed. In the later periods of the republic, property of the value of 400 *æstertia* was required for admission into it. The privileges of a knight or *equus* were, 1, to receive a horse from the state, as well as a sum of money for its keep; 2, a gold ring (hence *annulo aureo donari*, to have a gold ring granted one, that is, to be made a knight); 3, *angustus clavus*, a narrow strip of purple on the tunic; 4, a particular seat on public occasions. At first their duty was to serve the republic in war; but at a later period they became judges and farmers of the public revenues. Caius and Tiberius Gracchus wrested the right of being judges from the senate, and gave it to the equites. Some authors date the elevation of the equites to a third class at this period. Every fifth year the censor held a review of the equites, on which occasion they passed before him, leading their horses. If any one of their number had been guilty of any offence, even if he had only neglected his horse, the censor ordered it to be sold, which was equivalent to degrading him from the order; hence *adimere equum*, to take away his horse, that is, to degrade a knight. Others who had committed slighter offences, for which they were to be deprived of their rank, were omitted in the list, which was read aloud by the censor. The first on the list was called *princeps*. The farmers of the revenue were divided into classes, each having a president, called *magister societatis*; the members were called *publicani*. Under the later emperors the order disappeared from the stage of political life.

EQUIDÆ, the horse family, a family of the order Ungulata, including the horse, the ass, the mule, the zebra, the quagga, the dziggethai, and the dauw. They have but a single toe at the end of each of the limbs, and this toe is incased in a single undivided hoof. There are, however, on each side of the metacarpus and metatarsus two small rudimentary processes representing two lateral toes. The Equidæ have six incisors in each jaw, and six molars on each side in each jaw. The males have also two small canine teeth in the upper jaw, and sometimes in both jaws. The stomach is simple, but the intestines are long and the cæcum large. The female has two teats placed on the pubes. This family is divided into two genera, *Equus* (the horse), which has the tail covered with long hair to the base, the fore and hind legs with a wart on the inner side; and *Asinus* (including the ass, zebra, quagga, &c.), which has the tail covered with long hair at the extremity; the mane of the horse is long and flowing, while that of this genus is short and upright. In the horse's coat there is an obvious tendency to the formation of small round spots of a different shade from that of the ground, while in the genus *Asinus* the markings are invariably disposed in stripes.

EQUINOCTIAL, in astronomy, synonymous with equator. When the sun is on the equator there is equal length of day and night over all the earth: hence the name *equinoctial*. See **EQUATOR**.

EQUINOCTIAL GALES, storms which are observed generally to take place about the time of the sun's crossing the equator or equinoctial line, that is, at the vernal and autumnal equinox, in March and September. See **EQUINOX**.

EQUINOCTIAL POINTS are the two points wherein the equator and ecliptic intersect each other; the one, being in the first point of Aries, is called the *vernal point*; and the other, in the first point of Libra, the *autumnal point*.

EQUINOX is that time of the year when the day and night are equal: the length of the day is then twelve hours; the sun is ascending six hours, and descending the same time. This is the case twice a year, in spring and in autumn, when the sun is on the equator. When the sun is in this situation the horizon of every place is divided into two equal parts by the circle bounding light and darkness; hence the sun is visible everywhere twelve hours, and invisible for the same time in each twenty-four hours. (See **DAY**.) The vernal equinox is on the 21st March, and marks the beginning of spring; the autumnal is on the 23d September, which is considered the commencement of autumn; at all other times the lengths of the day and of the night are unequal, and their difference is the greater the more we approach either pole, and in the same latitude it is everywhere the same. Under the line this inequality entirely vanishes; there, during the day, which is equal to the night, the sun always ascends six hours, and descends six hours. In the opposite hemisphere of our earth the inequality of the days increases in proportion to the latitude: the days increase there while they diminish with us, and *vice versa*. The points where the ecliptic comes in contact with the equator are called *equinoctial points*. The vernal equinoctial point was formerly at the entrance of the constellation of Aries; hence the next thirty degrees of the ecliptic, reckoned eastward from it, have been called *Aries*; but this point long ago deserted the constellation of Aries, and now stands under Pisces; for it is found by observation that the equinoctial points, and all the other points of the ecliptic, are continually moving backward or westward; which retrograde motion of the equinoctial points is what is called the *precession of the equinoxes*. (See **PRECSSION**.) It appears from the result of calculations that the path of either of the poles is a circle, the poles of which coincide with those of the ecliptic, and that the pole will move along that circle so slowly as to accomplish the whole revolution in about 25,791 years nearly. The diameter of this circle is equal to twice the inclination of the ecliptic to the equator, or about 47°. Now, as the ecliptic is a fixed circle in the heavens, but the equator, which must be equidistant from the poles, moves with the poles, therefore the equator must be constantly changing its intersection with the ecliptic. And from the best observations it appears that the equator cuts the ecliptic every year 50°25' more to the westward than it did the year before; hence the sun's arrival at the equinoctial point precedes its arrival at the same fixed point of the heavens every year by 20 minutes 23 seconds of time, or by an arc of 50°25'. Thus, by little and little, these equinoctial points will cut the ecliptic more and more to the westward, till, after 25,791 years, they return to the same point.

EQUISETUM, a genus of cryptogamous plants, by some classed among the ferns, but generally regarded as a distinct order, *Equisetaceæ*. The species grow in wet places, and are popularly called *horsetails*.

The fructification is in terminal, oval, or conical heads, composed of peltate scales; the spores are furnished with two club-shaped elaters, which exhibit a high degree of susceptibility to moisture. The stem is striate, and contains articulations, each surrounded at the base with a scarios sheath, which is toothed on the margin; the branches are verticillate and destitute of leaves. The *E. hyemale* (shavegrass, Dutch-rush, or scouring-rush) has a remarkably rough stem, and is used for polishing wood, ivory, and the metals; for this purpose a piece of iron wire is introduced into the hollow of the stem, which is then rubbed against the substance under operation. The asperity of the cuticle is owing to its containing a considerable proportion of silica. It is imported into this country in considerable quantities from Holland, and is an article of commerce in other parts of Europe.

EQUITY. We call that, in a moral sense, *equity*, which is founded in natural justice, in honesty, and in right *ex æquo et bono*. So, in an enlarged view (as the learned Blackstone has observed, 3 Comm. 429), 'equity, in its true and genuine meaning, is the soul and spirit of all law; positive law is construed, and rational law is made by it. In this, equity is synonymous with justice; in that, to the true and sound interpretation of the rule.' Hence Grotius has defined it to be the correction of that wherein the law, by reason of its generality, is deficient. It is applied to cases which the law does not exactly define, but which it submits to the sound judgment of the proper interpreter, *arbitrio boni viri permittit*. In this sense equity must have a place in every rational system of jurisprudence; if not in name, at least in substance. It is impossible that any code, however minute and particular, should embrace or provide for the infinite variety of human affairs, or should furnish rules applicable to all of them. Every system of laws must necessarily be defective; and cases must occur to which the antecedent rules cannot be applied without injustice, or to which they cannot be applied at all. It is the office, therefore, of a judge to consider whether the antecedent rule does apply, or ought, according to the intention of the lawgiver, to apply to a given case; and if there be two rules nearly approaching to it, but of opposite tendency, which ought to govern; and if there exist no exact rule applicable to all the circumstances, whether the party has no remedy, or the rule furnishing the closest analogy ought to be followed. The general words of a law may embrace all cases; and yet it may be clear that all could not have been intentionally embraced; for, if they were, it would defeat the obvious objects of the legislation. So words of doubtful import may be employed, and of a more or less extensive meaning. The question, in such cases, must be, in what sense the words were used; and it is the part of a judge to look to the objects of the legislature, and to give such a construction of the words as will further those objects. He is not at liberty to set aside the law, but to expound it. *Custos non conditor juris, juvare, supplere, interpretari, mitigare jus civile potuit; mutare vel tollere non potuit* (Taylor's Elements of Civil Law, 214). This is an exercise of equitable construction. It is the administration of equity. Hence arises a variety of rules of interpretation of laws according to their nature and operation, whether they are remedial or penal, or restrictive of general right, or in advancement of public justice. But this is not the place to consider those rules, or the application of them in different systems of law.

In the law of England equity has a different and more restricted meaning. By English law remedies for wrongs, or for the enforcement of rights,

have been divided into two classes—namely, those administered in such courts as were specially designated courts of law, and those administered in courts of equity, the rights secured by the former being called *legal*; those secured by the latter being called *equitable*. The former are said to be rights and remedies at common law, the latter rights and remedies in equity. Formerly (and up till a comparatively recent time) there were two sets of courts in England, the courts of common law and the equity courts, respectively administering justice on two different systems and principles. It was chancery that had chiefly to administer equity, the equity courts being the court of the lords justices, of the master of the rolls, and of the three vice-chancellors. The distinction between common law and equity began to make itself felt in England at a comparatively early date, and led to direct application of suitors to the king when they found that they could not obtain the redress they sought from the ordinary courts. In the reign of Edward I. such applications began to be referred to the chancellor, and gradually the equitable jurisdiction of chancery arose. In the reign of Edward III. it became the practice for the chancellor to summon a party complained against to appear before his court and answer to the complaint, the party being examined upon oath. In this way he could be compelled to disclose important facts bearing upon the question in dispute, while the ordinary courts could not proceed in this manner. In the next reign cases in which trusts were concerned were removed from the jurisdiction of the common-law courts and were treated as the special province of the chancery court, as they have ever since been. Courts of equity have not been confined to England, but naturally passed as a legal institution to the American and other colonies. In the United States the system is not uniform, but in a number of the states law and equity are administered in the same courts. In Scotland the Court of Session administers both law and equity.

The most general description of a court of equity is, that it has jurisdiction in cases where a plain, adequate, and complete remedy cannot be had at law, that is, in the common law courts. The remedy must be *plain*, for, if it be doubtful and obscure at law, equity will assert a jurisdiction. So it must be *adequate* at law; for, if it fall short of what the party is entitled to, that founds a jurisdiction in equity. And it must be *complete*; that is, it must attain its full end at law; it must reach the whole mischief, and secure the whole right of the party, now and for the future; otherwise equity will interpose, and give relief.

The jurisdiction of a court of equity is sometimes concurrent with that of courts of law, and sometimes it is exclusive. It exercises concurrent jurisdiction in cases where the rights are purely of a *legal* nature, but where other and more efficient aid is required than a court of law can afford to meet the difficulties of the case and insure full redress. In some of these cases courts of law formerly refused all redress, but now will grant it. But the jurisdiction having been once justly acquired at a time when there was no such redress at law it is not now relinquished. The most common exercise of concurrent jurisdiction is in cases of account, accident, dower, fraud, mistake, partnership, and partition. The remedy is here often more complete and effectual than it can be at law. In many cases falling under these heads, and especially in some cases of fraud, mistake, and accident, courts of law cannot and do not afford any redress; in others they do, but not always in so perfect a manner. A court of equity also is assistant to the jurisdiction of courts of law, in many cases, where

the latter have no like authority. It will remove legal impediments to the fair decision of a question depending at law. It will prevent a party from improperly setting up at a trial some title or claim which would be inequitable. It will compel him to discover, on his own oath, facts which he knows are material to the right of the other party, but which a court of law cannot compel the party to discover. It will perpetuate the testimony of witnesses to rights and titles which are in danger of being lost before the matter can be tried. It will provide for the safety of property in dispute pending litigation. It will counteract and control or set aside fraudulent judgments. It will exercise in many cases an *exclusive* jurisdiction. This it does in all cases of merely *equitable rights*, that is, such rights as are not recognised in courts of law. Most cases of trust and confidence fall under this head. Its exclusive jurisdiction is also extensively exercised in granting special relief beyond the reach of the common law. It will grant injunctions to prevent waste or irreparable injury, or to secure a settled right, or to prevent vexatious litigations, or to compel the restitution of title-deeds; it will appoint receivers of property where it is in danger of misapplication; it will compel the surrender of securities improperly obtained; it will prohibit a party from leaving the country in order to avoid a suit; it will restrain any undue exercise of a legal right against conscience and equity; it will decree a specific performance of contracts respecting real estates; it will in many cases supply the imperfect execution of instruments, and reform and alter them according to the real intention of the parties; it will grant relief in cases of lost deeds or securities; and in all cases in which its interference is asked its general rule is that he who asks equity must do equity. If a party, therefore, should ask to have a bond for an usurious debt given up equity could not decree it unless he could bring into court the money honestly due without usury. This is a very general and imperfect outline of the jurisdiction of a court of equity, in respect to which it has been justly remarked that in matters within its exclusive jurisdiction, where substantial justice entitles the party to relief, but the positive law is silent, it is impossible to define the boundaries of that jurisdiction, or to enumerate with precision its various principles. Large powers are now given to all branches of the new Supreme Court of Judicature to administer equity, though many matters of equitable jurisdiction remain to be dealt with by the Chancery division of the High Court in the first instance. See the valuable works on Equity by Maddock and Jeremy, Lord Redesdale, &c.

EQUITY OF REDEMPTION. Upon a mortgage, although the estate, upon nonpayment of the money, becomes vested in the mortgagee, yet equity considers it only a pledge for the money, and gives the party a right to redeem, which is called his *equity of redemption*. If the mortgagee is desirous to bar the equity of redemption he may oblige the mortgagor either to pay the money or be foreclosed of his equity, which is done by proceedings in chancery by bill of foreclosure. See **MORTGAGE**.

EQUIVALENT. As the quantities by weight of bodies which combine with hydrogen, oxygen, and one another are fixed, there is always one simplest proportion in which they can be regarded as combining with or substituting one another. This quantity was called by Dalton the atomic weight, because he considered these proportions as the comparative weights of the atoms, or ultimate particles of the bodies. The term, however, was regarded as hypothetical, and both combining proportion and equivalent were proposed instead. The latter, which was

suggested by Dr. Wollaston, was accepted, and was till quite recently applied to elements and compounds. It has been shown, however, that quantities were thus styled equivalent, which were not so in any sense of the term. Thus, while one part by weight of hydrogen combines with 8 of oxygen, and 8 of oxygen with 14 of nitrogen, this quantity of nitrogen combines not with 1 but with 8 of hydrogen. Strictly, therefore, the quantity of nitrogen equivalent to 1 of hydrogen is $\frac{1}{8}$. The older equivalent notation was consequently irregular and unsystematic,—equivalents being used in some cases but not in others. Hence has arisen the modern use of the word, in which it is expressly distinguished from the combining proportion or atomic weight. The latter is the number which best denotes the proportion in which the substance reacts chemically with all other bodies, and which is fixed by reference not to mere proportional weight, but also to vapour density, specific heat, crystalline form, diffusion, &c.; physical phenomena, in which certain relations are so constant that they presumably indicate natural laws. The former simply denotes the proportion by weight in which a body combines with or replaces a unit of hydrogen.

In some cases the equivalent coincides with the combining proportion, in others it does not. Thus they coincide in the case of fluorine, chlorine, bromine, iodine, lithium, sodium, potassium, silver, and one or two others. In general, however, the combining weight is some multiple of the equivalent; thus the combining weights of oxygen, sulphur, selenium, and a large number of the metals, are double their equivalents; of nitrogen and some others, three times; of carbon, tin, &c., four times, and so on. With regard to the total equivalency of some elements, chemists are not agreed, and indeed it may be questioned whether the whole doctrine is anything more than a vague hypothesis.

ERA. See EPOCH and ERA.

ERARD, SEBASTIEN, a celebrated musical instrument maker, born at Strasburg in 1762, went to Paris at the age of eighteen, and in concert with his brother, Jean Baptiste, produced pianofortes so superior to any that had previously been made in France that his fame quickly spread, and orders flowed in upon him from all quarters. During the revolution he came to England and established a manufactory in London, and when peace was restored his life was passed between that city and Paris. His improvements upon the harp, more especially that of the double movement, the principle of which he afterwards communicated to the piano, entitle him to high merit as an inventor. He died in 1831.

ERASISTRATUS, a celebrated Greek physician, said to have been grandson of Aristotle. He lived in the third century before the Christian era. He was the court physician of Seleucus Nicator, king of Syria, and has rendered himself famous by the sagacity with which he discovered the malady of Antiochus, the king's son. The king had married in his old age a beautiful lady, Stratonice, and the young prince fell madly in love with her, but preferred to pine away in silence rather than disclose his passion. Erasistratus resolved to save the prince, but this required delicate manoeuvring. He went and told the king that his son was dying of a broken heart because an insuperable obstacle stood between him and the object of his passion. 'Who is the object of his passion?' inquired the king. 'My wife,' replied the physician; and as Seleucus implored Erasistratus to give up his wife to the prince Erasistratus asked the king if he would do so if he was so situated. 'Would to Heaven this were the case!' answered the king, 'I would not only give him Stratonice, but

my whole kingdom, if that would save his life.' Then Erasistratus told the king the whole truth, and the prince was made happy in the possession of the fair Stratonice and several provinces of the empire. Erasistratus was munificently rewarded for his tact and sagacity. Shortly after this event he went to Alexandria, where he gave up practising as a physician and devoted himself to the study of anatomy. He was the first who systematically dissected the human body, and his description of the brain and nerves is much more exact than any given by his predecessors. He classified the nerves into nerves of sensation and of locomotion, and it is said had almost stumbled upon the discovery of the circulation of the blood. He was remarkably averse to blood-letting and the giving of purgatives, relying chiefly upon diet and regimen, bathing, exercise, friction, and the most simple articles of the vegetable kingdom, for the restoration and preservation of health. He wrote several works on anatomy, practical medicine, and pharmacy, of which only the titles remain, together with a great number of short fragments preserved by Galen and other ancient medical writers.

ERASMUS, DESIDERIUS, a celebrated scholar, was born at Rotterdam in 1467, being the illegitimate son of a Dutchman of Gouda, by name Gerard—of which Desiderius is the Latin, and Erasmus, or, more correctly, Erasmius, the Greek equivalent—and the daughter of a physician. He was a singing-boy in the Cathedral of Utrecht till his ninth year, then entered the school at Deventer, where he displayed such brilliant powers that it was predicted that he would be the most learned man of his time. After the death of his parents, whom he lost in his fourteenth year, his guardians compelled him to enter a monastery; and at the age of seventeen he assumed the monastic habit. The Bishop of Cambray delivered him from this constraint. In 1492 he travelled to Paris to perfect himself in theology and polite literature. He there became the instructor of several rich Englishmen, from one of whom—Lord Montjoy—he received a pension for life. He accompanied them to England in 1497, where he was graciously received by the king. He returned soon after to Paris, and then travelled into Italy to increase his stock of knowledge. In Bologna, where he received the degree of Doctor of Theology, he was one day mistaken, on account of his white scapulary, for one of the physicians who attended those sick of the plague; and, not keeping out of the way of the people, as such persons were required to do, he was stoned, and narrowly escaped with his life. This accident was the occasion of his asking a dispensation from the vows of his order, which the pope granted him. He visited Venice, Padua, and Rome; but brilliant as were the offers here made him, he preferred the invitation of his friends in England, where the favour in which he stood with Henry VIII. promised him still greater advantages. When he visited the lord-chancellor, Sir Thomas More, without making himself known to him, the chancellor was so delighted with his conversation that he exclaimed, 'You are either Erasmus or the devil.' He was offered a benefice, but was unwilling to fetter himself by an office of this kind. He was for a short time professor of Greek at Oxford. He afterwards travelled through Germany and the Netherlands, and went to Basel, where he had his works printed by Froben. He died in 1536. His tomb may be seen at Basel, in the Calvinistic cathedral.

To profound and extensive learning Erasmus joined a refined taste and a delicate wit. Naturally fond of tranquillity and independence, he preferred the pleasure of literary ease and retirement to the pomp of high life. His caution and worldly prudence offended

many of the best men of his times. He did great and lasting service to the cause of the revival of learning. Although he took no direct part in the Reformation, and was reproached by Luther for lukewarmness, he attacked the disorders of monasticism and the prevalent superstitions, and everywhere promoted the cause of truth. He wished for a general ecclesiastical council, to be composed of the most learned and enlightened men, but had not the satisfaction of seeing his wish accomplished. What he did to serve the world was effected by his writings, which will always be prized for their interesting matter and graceful style. The best edition is by Le Clerc (Leyden, 1703, ten vols. folio). Besides his editions of various classics, the first edition of the Greek Testament from MSS. (with Latin translation), and his other philological and theological writings, we will only mention his well-known book in praise of folly, *Encomium Morie*, and his *Colloquia*. His letters are very valuable in reference to the history of that period. Among the various biographies of Erasmus we may mention that by Robert B. Drummond (London, 1873, two vols.), and the *Life and Letters* by J. A. Froude (1894).

ERASTIANISM. See next article.

ERASTUS (the Græco-Latin equivalent of Lieber), the learned name of Thomas Lieber, a German physician, who maintained the opinions from which the well-known epithet of *Erastian*, as now used, is derived. They are contained in a treatise of his on Excommunication, in which he declared that the Church was entirely subservient to the civil power, and had no right to refuse the sacraments to, or pass ecclesiastical censures on, any one, and that the secular magistrate had the entire and exclusive cognizance of all offences, civil and religious. Erastus was born at Baden, in Switzerland, or near Badenweiler, in 1524. He studied theology, philosophy, and literature at the University of Basel, and afterwards visited Italy, where he devoted himself to medicine. He was successively professor of medicine at Heidelberg, and of ethics at Basel, where he died on Jan. 1, 1583. He also wrote on the Lord's Supper, besides a number of medical works.

ERASURE, or RASURE, in law, the scraping or shaving of any deed or other written instrument for the purpose of amendment or alteration. In England an erasure or interlineation is presumed in a deed, in the absence of rebutting evidence, to have been made before or at its execution; in a will it is presumed to have been made after its execution. Erasure in a deed, without consent of the party bound by it, will make it void. In Scotland it is inferred that all erasures and alterations have been made after the execution of the deed. Care must be taken in all cases that all words erased, deleted, altered, or added should be written in the margin, or in the body of the writing if before signature, and that such erasures and alterations be duly signed by the party bound, and by the witnesses.

ERATO (from Greek *ερα*, I love), one of the Muses, whose name signifies loving, or lovely. She presides over the songs of lovers, and touches, as Ovid, in his *Art of Love*, informs us, the hearts of the coldest maidens by her tender lays. See **MUSES**. Erato is also the name of one of the planetoids.

ERATOSTHENES, a learned Greek in the times of the Ptolemies, born at Cyrene, in Africa, B.C. 276. He became librarian at Alexandria, and improved the science of mathematical geography, which he reduced to system. He gained his greatest renown by his investigations of the size of the earth, his estimate of the circumference of which was surprisingly near the truth. He wrote also on chronology, grammar, &c., and was considered no mean poet. He rendered much service to astronomy, and

first observed the obliquity of the ecliptic. He died about B.C. 196, and is said to have starved himself to death after becoming blind. The extant fragments of his writings were collected by Bernhardt in his *Eratosthenica* (1822); his geographical fragments were published by Berger in 1880.

ERBIUM, along with yttrium and a number of other rare elements, occurs in some rare minerals, the chief sources being euxinite, fergusonite, and gadolinite, in which it exists as a silicate or tantalate. Its compounds were first distinguished by Mosander in 1843 from those of yttrium, while subsequent investigators have tried to show that no such bodies exist, but are mere mixtures of others. Further examination of the subject has, however, established the existence of this element. Its separation from the minerals in which it occurs is an excessively laborious and difficult operation. It is obtained from gadolinite by decomposing with hydrochloric acid, precipitating with oxalic acid, dissolving in nitric acid, adding solid sulphate of potassium, filtering, and adding oxalic acid to precipitate the erbia and yttria. This process is repeated till the compound, examined by the spectroscope, is seen to be free from didymium. The erbium and yttrium nitrates are afterwards separated by repeated crystallizations. Metallic erbium has not yet been obtained. Its oxide is a yellow or orange-coloured, or, according to others, a rose-red powder, remaining after ignition of the oxalate or nitrate. The hydrated oxide is a white gelatinous precipitate which absorbs carbonic acid from the air, and which readily dissolves in acids, forming pink or rose coloured salts. They have an astringent taste. Erbium compounds are especially distinguished by their spectra. When oxide of erbium is heated to a white heat, it emits an intense green light which, in the spectroscope, is found to be continuous, but intersected by a number of bright bands. In solution, however, erbium compounds absorb certain rays, and these are found to coincide with the lines of greatest intensity in the emission spectrum. In this respect erbium resembles didymium (which see), but the spectra of the two bodies are absolutely different from one another.

ERCILLA Y ZUNIGA, DON ALONSO DE, knight of the order of Santiago, and chamberlain to the Emperor Rudolph, the third son of a Spanish jurist, who was also a knight of the above order. When he was born is uncertain, but it was before 1540, most probably in 1533. His mother, from whom he inherited the name of Zuniga, carried him, after the early death of his father, to the court of the Empress Isabella, consort of Charles V. The young Alonso was page to the Infant Don Philip, and accompanied him on his travels through the Netherlands and a part of Germany, and through Italy, Poland, Bohemia, and Hungary, and in 1554 went with him to England, on the occasion of his marriage with Queen Mary. Soon after this, an insurrection breaking out among the Araucanians, a tribe of Indians on the coast of Chili, Erquilla joined an expedition sent against them. The difficulties the Spaniards had to encounter, the heroic resistance of the natives, and the multitude of gallant deeds by which the war was signalized, inspired the young and brave Erquilla with the idea of making it the subject of an epic poem, to which he gave the name of *La Araucana*. He began the work on the spot, writing often during the night what had been achieved in the day ('now handling the sword, now the pen'), and was obliged sometimes, for want of paper, to use pieces of leather. Erquilla is said afterwards to have come near losing his life by reason of a groundless charge of mutiny, and to have been actually on the scaffold before his innocence was made known. He returned to Spain after

having finished the first part of his epic. All this he performed before completing his twenty-ninth year. In 1570 he married Maria Bazan at Madrid, whose charms and virtues are celebrated by him in various passages of his poem. In 1569 the first fifteen cantos of his poem, in 1578 a second, and in 1590 a third part were added, making in all thirty-seven cantos; he did not live, however, to complete the work. His merits were not rewarded; for he died at Madrid in great poverty and obscurity. The time and circumstances of his death are uncertain; he must have been alive, however, in 1596, as Mosquera, in his book on military discipline, speaks of him as his contemporary. He left no legitimate children.

The *Araucana* is an historical epic in the octave measure, in which the author confines himself, with the exception of some episodes and a few fictions, to the exact historical course of events. Hence the poem often assumes almost the character of a chronicle. Voltaire's judgment on this poem (in his *Essai sur la Poésie épique*) shows that he had not read it. Cervantes, in the sixth book of *Don Quixote*, ranks it by the side of the best Italian epics; but probably few persons, uninfluenced by patriotic pride, will agree with him. It has been continued by a certain Don Diego de Santisteban Osorio. Lope de Vega has taken from the epic of Ercilla the materials for his piece *Arauca Conquered*. The best editions are those published at Madrid in 1776 and 1828. It has been translated into Italian, and twice into French, but abridged (Paris, 1824). See *ARAU-CANIANS*.

ERDMANN, OTTO LINNÉ. This distinguished chemist was the son of the physician who introduced vaccination into Saxony, and he was born at Dresden April 11, 1804. After his school instruction he was apprenticed to an apothecary, studied medicine, and devoted himself at last to chemistry. At the age of twenty-one he became a teacher, two years later extraordinary professor, and was finally appointed to the newly-founded chair of technical chemistry in Leipzig, which office he held till his death. As a teacher he excelled in the clearness and elegance both of his lectures and of his experimental illustrations, and had the power of creating and sustaining interest in his subject. His own researches embrace a wide range of subjects. He examined minutely the technology of nickel, and described some of its compounds; analyzed a number of minerals and slags, and experimented on several other points of inorganic chemistry. In organic chemistry his chief research is upon indigo, in the course of which he discovered isatin, but there are besides a great number of other researches, as upon colouring matters, sugar, butyric acid, phloridzin and salicin, &c. &c. The most important work in which he engaged was that upon the combining weights of several of the elements. In company with Marchand he made determinations of oxygen, carbon, hydrogen, sulphur, calcium, copper, mercury, and some others, and his numbers have been fully confirmed by subsequent experimenters. Erdmann was the author of a chemical text-book, and for many years conducted the *Journal für technische und ökonomische Chemie*, which was afterwards changed to the *Journal für praktische Chemie*, periodicals amounting to 100 volumes, the latter still occupying an important place. Besides his professional duties Erdmann found time for engaging in various concerns connected with the town of Leipzig, and his advice and knowledge thus became of use to his fellow-citizens more directly even than by his professional instruction. He died October 9, 1869, after a painful illness.

EREBUS, in the Greek mythology, the son of

Chaos and Darknem. He married his sister, Night, and was the father of the Light and Day. The Moirai, or Fates, by some are called his daughters. He was transformed into a river, and plunged into Tartarus, because he aided the Titans. From him the name Erebus was given to the infernal regions, particularly that part of it which is designated as the abode of virtuous shades, and from which they pass over immediately to the Elysian fields. Erebus is still sometimes used for the infernal regions.

ERECOTHEUS. See *ERICOTHEUS*.

EREMACAUISIS, slow combustion (from Greek *έρμα*, gently, and *καυσίς*, burning), a term employed by Liebig to denote the gradual combination of the constituents of a combustible substance with the oxygen of the air. It is distinguished from fermentation by not apparently requiring contact with a ferment, that is, a substance undergoing decomposition, and maintaining it in others; and from putrefaction by both being unable to maintain itself without air, and to communicate its influence to other bodies. Under particular circumstances, however, decay may become putrescence, and putrescence decay, by altering the amount of air supplied. Eremacausis may take place either in nitrogenized or in non-nitrogenized matter, and a great number of actions are ascribed by Liebig to its influence. The conversion of alcohol into vinegar, of nitrogen into nitric acid, of wood into the brown substance called humus; the gradual oxidation of vegetable and animal tissues and fluids, the bleaching of cloth by exposure to light, air, and moisture, are all instances of this action. To produce it, however, certain conditions are necessary: moisture is required, and a definite temperature, which differs for different substances. This slow combustion, therefore, is prevented by lowering the temperature, excluding oxygen and water, and applying the ordinary antiseptics. That the action is really slow combustion is shown by different phenomena. If a decaying body be kept in contact with a limited amount of air the oxygen is slowly removed and carbonic acid and water are given off. If cloth be exposed too long in bleaching the fibre is gradually disorganized and converted into a humus-like substance. In eremacausis the oxygen of the air combines first with the hydrogen, and the carbon combines with oxygen already contained in the substance, and hence, as the decay advances, the residue becomes always richer in carbon, until at last either a nearly pure carbonaceous residue is left or a complex but stable compound containing carbon, hydrogen, and oxygen, incapable of being acted on by the air. In this kind of low combustion the heat given off may sometimes be hardly appreciable; but when it takes place through a large mass of matter, such as heaps of coal, cotton waste, especially when oily, lamp-black, gunpowder-charcoal, the temperature is perceptibly higher than the air, and has often risen sufficiently to end in a regular combustion. Light is often perceived also on decaying wool and animal matter. When the decaying body contains nitrogen the phenomena are more complicated, and the substances obtained depend on the presence of alkalies or alkaline earths. Thus the nitrogen may be evolved as a gas, or it may be converted into ammonia, or it may be oxidized to nitric acid. Sometimes also the decaying body absorbs nitrogen or ammonia from the air, and gives rise to nitrogenized colouring matters. The whole subject of eremacausis is extremely imperfectly known, and it may be questioned whether there is any essential difference between it and other forms of decay.

EREMITE (from the Greek *έρμος*, a desert), a hermit, or religious devotee who secludes himself from society. See *ANCHORITE*.

ERFURT, an important town in the Prussian province of Saxony, formerly the capital of Thuringia, and a fortress (up till 1873), situated on the river Gera, about 18 miles w. of Weimar by rail. In the fifteenth and sixteenth centuries Erfurt was a flourishing commercial place, chiefly notable for its woollen and linen manufactures, while its university made it one of the most famous of German cities. It then had not less than 80,000 inhabitants, but latterly only a fraction of this. In 1867 its population was only 41,760; in 1900 it had risen to 85,190. The university, established in 1378, was suppressed in 1816. The town presents an imposing appearance, with its many towers, its old cathedral and church of St. Severus, situated on a rising ground, and its two citadels (no longer used as such). Its trade and manufactures have rapidly increased in recent times along with its population. The most characteristic industry is that of flower-growing, plants and seed being exported in enormous quantities, the seed to almost all parts of the world. The most important edifice is the cathedral, which consists of several portions in different styles, forming a striking and irregular whole. The large bell called *Maria gloriosa*, made of the finest bell-metal, and weighing 275 cwt., hangs in one of the towers of the cathedral. The cell in which Luther lived while an Augustine monk, from 1505 to 1512, containing his Bible, portrait, &c., used to be shown. It was in the Martinistift or orphan-house into which the old Augustine convent had been converted, but was destroyed by fire, along with the relics of Luther, in 1872. According to tradition Erfurt was founded as early as the fifth century, by a certain Erpes. It was not a free imperial city, but always maintained a sort of independence, notwithstanding the claims of the Elector of Mentz. In 1483 it concluded a treaty with Saxony, by which it agreed to pay an annual sum for protection. In the seventeenth century the Elector of Mentz obtained possession of it. The Congress of Erfurt (Sept.-Oct. 1808) was attended by Napoleon, Alexander of Russia, and many German sovereigns. In 1813 the town was taken by the Prussians, after a severe bombardment. In 1814 it was granted to Prussia by the Congress of Vienna. The government, of which it is the capital, contains 1263 square miles, with 466,419 inhabitants in 1900.

ERGOT is a diseased state of the grain of several cultivated grasses, particularly rye, which, when in this state, is commonly called *spurred* rye. At the beginning of the malady the ovary does not appear to be affected, retaining its colour, but being a little more tender than usual. The ovule is at that time white, but surrounded by a yellow viscid substance. It then swells immensely, bursts its integuments, becomes more or less elongated, with frequently a considerable curvature, according to the species of grass or corn which is attacked; sometimes projecting like a cock's spur (whence the name, which is French, and means in that language a cock's spur as well as the disease) far beyond the surrounding glumes, assuming a gray, brownish-purple, violet, or at length a black tint, and crowned frequently with the withered style and integuments carried up by the elongated ovule. Often only one or two of the grains on a spike are ergoted, the ovules of many being abortive, though the diseased structure has not been perfected. Great diversity of opinion existed as to the nature of this disease; it is now, however, universally recognized as due to the presence of a minute parasitical fungus, which causes a preternatural growth of the ovule. The rye ergot fungus is called the *Claviceps purpurea*; its mycelium alone exists in ergot, but if the ergoted grains are sown the fungus develops itself in the perfect form, growing in little tufts from the surface of the ergot, with

stem about $\frac{1}{2}$ inch long, and subglobular head. When bread containing this substance has been eaten it produces serious consequences, sometimes gangrene of the extremities and death. Ergot is an important article in *materia medica*. It has been found capable of exerting a powerful and specific action upon the uterus, and is administered in small doses to hasten delivery in extreme cases.

Ergot has been repeatedly analyzed, and a variety of oily and ill-defined substances from it have been described. Among other things it yields trimethylamin when heated with potash or soda, and it has been specially attempted to prove that it contains an alkaloid as its active principle. A substance called *ergotin* has been mentioned by three different chemists, but their observations do not tally, and a second alkaloid called *ecbolin* still requires confirmation. According to the most recent account ergotin and ecobolin are brown, bitter, alkaline, amorphous powders, readily soluble in water and in alcohol, and forming amorphous salts. Their physiological action is doubtful. The preparations of ergot employed in medicines are all mixtures: they are the ethereal extract, a deep brown fluid; the alcoholic tincture, reddish brown; and the watery infusion.

ERIC. Fourteen kings of this name have reigned in Sweden, the last of whom ascended the throne on the death of his father, Gustavus Vasa, in 1560. He exhibited much energy of character, but drove his brothers to rebellion by his violence and severity. His tyranny and a disgraceful marriage with a Swedish peasant girl alienated the minds of his subjects; and his brothers, John and Charles, formed a party against him, which deprived him of the crown in 1568 with the consent of the states. He died (1577) in prison by poison. He was active and industrious. A patron of the arts, he esteemed and patronized artists and mechanics, received the Huguenots with open arms, abolished many superstitious usages in religion, and rendered commerce and navigation flourishing. His judicial institutions, too, are particularly worthy of praise. He created a high nobility in Sweden, by conferring the dignity of count and baron.

ERICACEÆ, a natural order of exogenous plants, deriving its name from its most extensive genus, the *Erica*, or heaths. The order consists of a very small number of trees, a great variety of shrubs and undershrubs, having their leaves alternate, opposite, or verticillate, generally evergreen and rigid. The calyx has four to five divisions, more or less deep; a monopetalous corolla, generally regular, with lobes alternating with those of the calyx; stamens definite, equal in number to the segments of the corolla or twice as many. Ovary free, surrounded at the base by a disk or scales. The fruit is capsular or baccate, and many celled. The order is unknown in very hot countries except at considerable elevations. The beautiful and showy plants belonging to this order are found in great numbers in South Africa, also in America, Europe, and Asia. Several narcotic and poisonous plants belong to this order, such as *Rhododendron ponticum*, *Asalea pontica*, various *Kalmias* and *Andromedas*.

ERICHTHONIUS, or **ERECHETHEUS**, in fabulous history, the son of Dardanus and Batela, and grandson of Zeus, was King of Troas. He was the richest man in his kingdom, having in his meadows 8000 mares with foals. Boreas fell in love with one of these mares, and transformed himself into a horse. The product of this union was twelve colts, which bounded over the plains without injuring a spike of grass, and skimmed the waves of the sea. Erichthonius obtained the Kingdom of Troy by the death of his brother Ilius without children. He married

Astyoche, the daughter of *Simois*, by whom (or according to some by *Callirhoë*, the daughter of *Scamander*) he became the father of *Tros*.

Another *ERICHTHONIUS*, king of Athens, was, as fable relates, the son of *Hephaestus* and *Atthis*, daughter of *Oranauus*. *Erichthonius* was educated in the temple of *Athena* by the goddess herself. When he grew up he drove *Amphictyon* from his throne, and reigned in his stead. He erected a statue to *Athena*; or, according to some, a temple in the citadel, and instituted in her honour the festival called *Panathenaea*. The fabulous history of this *Erichthonius* is differently related. He is said to have had partly the form of a serpent.

ERIDANUS (probably the *Po*, in Italy, with which it was latterly identified), a river famous in mythology, mentioned in the return of the *Argonauts*. When *Phaethon* was struck by the thunderbolts of *Zeus* he fell into this river—and his three sisters, the *Helades*, lamented him till they were changed into poplars. They did not cease to weep for him even in this condition; and their tears falling into the water of the river, became transparent amber.

ERIE, one of the great chain of North American lakes, between *Lakes Huron* and *Ontario*. It lies N.E. and S.W., between lat. 41° 30' and 42° 52' N.; and lon. 78° 53 and 83° 25' W. It is about 265 miles long, 63½ miles broad at its centre, from 40 to 46 fathoms deep at the deepest part, and has an area of 9600 square miles. Its surface is 565 feet above sea level, and 30 feet below *Lake Huron*, which is 45 miles north from it. The whole of its southern shores is within the territory of the United States, and its northern belong to *Canada* (prov. *Ontario*). It receives the waters of *Lakes Superior*, *Michigan*, *Huron*, and *St. Clair*, through the *St. Clair* and *Detroit* rivers at its south-western extremity, and discharges its waters into *Lake Ontario* by the *Niagara River*, at its north-east end. Several small islands are scattered over the west end of the lake; only one of which, *Point Pele Island*, is inhabited. This is the most dangerous of all the lakes to navigate in stormy weather, in consequence of the heavy ground-swell, proceeding from its shallowness. It has, however, owing to the construction of canals and railways, connecting its ports with the seaboard and the interior, a vast and increasing traffic, carried on both by steamers and sailing vessels. The banks vary in height; no portion of them, however, is above 100 feet high. The principal harbours on the Canadian side are *Port Dover*, *Port Stanley*, and *Burwell*; those on the United States side are *Buffalo*, *Erie*, and *Cleveland*.

ERIE, a city and port of entry, United States, Pennsylvania, finely situated on *Presque Bay*, on the southern shore of *Lake Erie*, 307 miles north-west of *Philadelphia*, with which it is connected by railway. There are numerous iron-works (including foundries, rolling-mills, blast furnaces, &c.), petroleum refineries, breweries, tanneries, wood-working factories, &c. The harbour is one of the best on the lake, and the trade of the place, consisting chiefly of coal, iron, petroleum, and agricultural produce, is considerable. Pop. in 1890, 40,634; in 1900, 52,733.

ERIGENA, *JOANNES SCOTUS*, an eminent scholar and metaphysician, born about the beginning of the ninth century, whether in Ireland or in Scotland is uncertain. He spent a great part of his life at the court of *Charles the Bald* of France, and was placed at the head of the school of the palace. The king further imposed upon him the double task of translating into Latin the Greek works of the pseudo *Dionysius the Areopagite*, and of composing a treatise against *Godechalco*, on *Predestination* and *Free-will*. This treatise, and another, *De Divisione Naturæ*, contained many views in opposition to the

teachings of the church. They were condemned by the councils of *Valencia* in 855, and of *Langres* in 859, and *Pope Nicholas I.* demanded the immediate disgrace of the culprit. His subsequent history is not known, and the date of his death is variously stated at from 874 to 886. He has been sometimes identified with *John*, an ecclesiastic who was called over from Gaul by *Alfred the Great*, and was placed by the king at the head of a newly founded college or school. The doctrines which roused the ire of the church against *Erigena* are briefly as follows: Authority is derived from reason and not reason from authority; when they are conflicting authority is of no value. In his *De Divisione Naturæ* he divides nature into four categories: 1, God, who possesses and diffuses life; 2, the first causes, or eternal ideas by which he accomplishes his work; 3, the sensible world of creation, of which man is the summit; 4, God, as he shall at last be when the perfected world, its destiny being fulfilled, shall return to him. The pantheism lurking in the system was first clearly recognized in the thirteenth century by the Council of *Paris*.

ERINACEUS, a genus of animals, of which the hedgehog is the type. See *HEDGEHOG*.

ERINITE. This name has been given to two totally different minerals, both of them found in Ireland, and both of a green colour. One, very rare, found in *Limerick*, is a hydrated arseniate of copper, and consists of rough mammillated collections of fibrous and minute crystals. It is of a brilliant apple-green, is brittle, and is soluble in acids. Sp. gr. 4.

The other, found at the *Giant's Causeway*, is a silicate of aluminium, opaque and resinous, with colour varying from yellowish red to green. Specific gr. 2. It contains twenty-five per cent. of water, which it loses on heating, and it is classed by *Thomson* among the zeolites.

ERINNA, a Greek poetess who lived about the sixth century before the Christian era, and whose birth-place is variously stated. According to some she was a Lesbian, and the intimate friend of *Sappho*. Others aver that she was born at *Tos*, *Rhodes*, or *Telos*, and that she lived in the age of *Demosthenes*; while others again assert that there were two poetesses of the same name. She died at the age of eighteen, leaving behind her a few poems which were thought equal to those of *Homer* in point of merit. The chief of them was a work of about 300 lines, called *Elakats* (The Distaff), of which nothing has come down to us. An epitaph or two which are still extant, and believed by some to be hers, are by others deemed spurious.

ERINNYES. See *FURIES*.

ERIMETER (Greek, *erion*, wool, and *metron*, a measure), an instrument invented by *Dr. Thomas Young* for measuring the diameter of minute fibres (as those of wool) and globules (as those of blood). Its principle depends upon the fact that a portion of the shadows cast by these small objects, placed in front of a strong light, assumes the form of concentric circles of the different colours of the spectrum; the diameter of these circles being proportionate to that of the objects, and also to the distance of these from the surface on which the circles are formed. The instrument is thus described in *Sir David Brewster's Optics*: 'It is formed of a piece of card or brass plate, having an aperture of $\frac{1}{10}$ of an inch in diameter, in the centre of a circle of $\frac{1}{2}$ inch in diameter, and perforated with about eight small holes. The fibres or particles to be measured are fixed in a slider; and the erimeter being placed before a strong light, and the eye being assisted by a small lens behind the hole, the rings of colour will be seen. The slider must then be drawn out or pushed till the limit of the first

red and green ring coincides with the circle of perforations, and the index will then show on the scale the size of the particles or fibres.

ERIPHYLE, in the Greek mythology, daughter of Talauus, and wife of Amph'araus, whom she betrayed for a necklace presented to her by Polynices. The necklace was made by Hephestus (Vulcan), and had the power of rendering whoever wore it unlucky.

ERIS, in the Greek mythology, the goddess of discord, daughter of Night, and sister of Nemesis and the Paros or Fates; not being invited to the marriage of Peleus, she revenged herself by means of the apple of discord. See **PARIS**.

ERITH, a town of Kent, England, on the right bank of the Thames, about 14 miles east of London, contains an interesting old church, and various other places of worship, a public hall, a cottage hospital, the Maxim-Nordenfeldt gun-factory, engineering works, and manufactures of glue, oil, manure, iron, bricks, &c. It has a trade in coal, and several yacht clubs have their headquarters here. Erith is a pleasant place, and is now a favourite resort of summer visitors from London. Pop. in 1881, 9812; in 1891, 13,414; in 1901, 25,295.

ERIVAN, a fortified town of Russia, capital of the government of the same name in Transcaucasia, partly on a hill and partly on the left bank of the Sanga, 33 miles N.N.E. from the foot of Mount Ararat. The only buildings of note are several Armenian churches and mosques, a large bazaar, and a castle or palace crowning a height. The manufactures consist of cottons, earthenware, and leather; and the situation of the town, on the caravan route between Russia and Persia, gives it a considerable transit trade. Pop. (1897), 29,033.—The government has an area of 10,745 square miles, and a pop. of 1,028,003.

ERLANGEN, a town of Bavaria, situated on the Regnitz, at the confluence of the Lower Schwabach, 12 miles north of Nürnberg, on the railway to Bamberg and on the Ludwig's Canal. After the greater part of it was consumed by a fire in 1706 it was rebuilt in a much improved form. It is nearly of a square shape, and its streets cross each other at right angles. The buildings most deserving of notice are the churches, the old castle and the town-house, both forming part of the finest square which the town contains; the theatre; and the university, attended by about 1100 students, and provided with a good library, museum, botanic garden, &c., and celebrated at present as a school of Protestant theology. Among monuments the town has statues of the Margrave Frederick, founder of the university, and of the Emperor William I. (1897). Important industries were established by the French emigrants who found an asylum here after the revocation of the Edict of Nantes. The town now carries on cotton-spinning, tanning, glove-making, brewing, &c. The environs are laid out in gardens and fine walks. Pop. (1900), 22,953.

ERLAU, or **EGER**, a town of Hungary, capital of county Heves, on the Eger, 65 miles E.N.E. of Budapest. It is surrounded by vineyards, is generally well built, is the see of an archbishop, and has a handsome modern domed cathedral, a ruined castle, which figured much in the wars with the Turks, an archiepiscopal palace, with a good library, a lyceum, a diocesan seminary, court-house, and hospital. The manufactures consist chiefly of woollen and linen cloth, hats, combs, leather, shoes, and harness. The finest red wines of Hungary are made from grapes grown in the neighbourhood. Two thermal springs, one on each side of the river, are well frequented. Pop. (1890), 22,427; (1900), 25,893.

ERLKING, the English form of the German *Erlkönig*, a mythical personage first introduced into German poetry through Herder's translation of a

Danish ballad, *The Erlking's Daughter*, and made familiar to all readers by Goethe's ballad, *Der Erlkönig*, or translations of it. This being is represented as exercising a malignant and fatal influence upon men, and especially children, by alluring promises or visions. The word is of Danish origin (*Erl-konge*), and signifies elf-king.

ERMENONVILLE, a village in the French department of Oise, about 18 miles to the northeast of Paris, with a château and park, in which the remains of Rousseau (who died here in 1778) were entombed, but from which they were afterwards removed to the Pantheon at Paris. Pop. (1896), 460.

ERMINE (*Mustela erminea*, Linn.), an animal belonging to the tribe Digitigrada, of the order Carnivora. It is found in the northern parts of Europe, Asia, and America in great abundance; but it occurs even in the middle states of America, and also in the temperate parts of Europe. In some parts of Canada ermines are very abundant. In the middle and eastern states of America it is known as the *weasel*; farther north, and in England, it is called *stoat* in its summer and *ermine* in its winter hair. In France, in summer, it is termed *rosette*, and in winter *hermine*: in this state it is the *Mus Ponticus* of Pliny. The habits of the ermine are very similar to those of the common weasel of Europe. It frequents barns and outhouses, generally making its retreat beneath the floor or elsewhere. It feeds on mice and rats, and soon clears its haunts of these mischievous animals; but it does not always confine itself to this food. It is very destructive to poultry, birds, and young rabbits, and is also a great devourer of eggs. In pursuit of prey it displays great quickness and agility. During the winter it is extremely difficult to catch sight of the ermine, from its colour so closely resembling that of the snow. Like other species of this genus, the ermine has the faculty of ejecting a fluid of a musky odour. In its summer dress it is of a light ferruginous or chestnut-brown colour over the head, back, sides, and upper half of the tail; the under part is nearly of a pure white; the lower portion of the tail becomes gradually darker, till, at the extremity, it is quite black. Its fur is short, soft, and silky. In its winter coat it is of a pure white over the whole head, body, and limbs, the lower half of the tail alone retaining its dark hue. The fur at this time is much longer, thicker, and finer than in summer. In Norway it is taken in traps baited with flesh; in Siberia it is often shot with blunt arrows, or taken in a trap made of two flat stones, propped by a stick, to which is fastened a baited string, which, on the least touch of the animal, releases the stone, which falls and crushes it. The fur of the ermine is in great request; it was formerly one of the insignia of royalty, and is still worn by judges. When used in this way the black tuft from the tail is commonly sewed to the skin at irregular distances. This animal is not readily tamed; when caught, and kept in a cage, it exhibits every mark of its fierce and savage character. See illustration at **CARNIVORA**.

ERNE. See **SEA-EAGLE**.

ERNE, **LOUGH**, a lake of Ireland, in county Fermanagh, consisting of a north or Lower, and a south or Upper lake, connected by a narrow winding channel, and properly forming only expansions of the river Erne. Upper Lough Erne, about 12 miles long by 2 miles broad, and from 3 to 12 fathoms deep, contains numerous small islands, but has tame and marshy shores. The Lower Lough, about 15 miles long by 5 miles broad, and in some places 37 fathoms deep, presents several bold and picturesque acclivities, some of them crowned with ruined castles. Both lakes are well stocked with trout, salmon, pike, perch, bream, eels, &c., but owing to numerous shoals are navigated

only by flat-bottomed boats.—The River Erne rises in Lough Gounagh, in the county of Longford, flows π , traverses the county of Cavan, and falls into the Upper Lough Erne. It appears again at the north end of the lower lake, forming the outlet of both lakes, carrying their waters to Donegal Bay, below Ballyshannon, a distance of about 8 miles. A succession of falls occur from Balleck to Ballyshannon.

ERNEST AUGUSTUS, King of Hanover, known also by his title of Duke of Cumberland, was the fifth son of George III., and born on 5th January, 1771. He became a field-marshal in the British army, and in 1815, greatly to the indignation of his mother, Queen Charlotte, married, as her third husband, Princess Frederika Caroline of Mecklenburg-Strelitz. He took up his abode at Berlin, and resided there for a number of years, but returned to England while the discussions on Catholic emancipation were going on, and endeavoured by every means in his power to prevent the passing of that measure. On the death of William IV. in 1837 he ascended the throne of Hanover, in consequence of the succession to the sovereignty of that country being limited to male heirs. His arbitrary and tyrannical disposition, which had hitherto shown itself in opposing every step in the way of political reform and progress, was now manifested by his abrogating the constitution which had been granted in 1833. In 1848, however, he was compelled to accede to popular demands, and accord the nation a more liberal form of government. He died on 18th November, 1851, and was succeeded by his son, George V., the last of the Hanoverian kings. The unpopularity of the Duke of Cumberland in Britain was extreme, and the contingency of his succeeding to the throne was regarded as one of the greatest misfortunes that could befall the nation.

ERNESTI, JOHANN AUGUST, founder of a new theological and philosophical school in Germany, was born at Tennstedt, in Thuringia, 1707. He studied theology at Pforta, Wittenberg, and Leipzig. Having been made associate instructor (1731) and rector (1734) of the Thomas School in Leipzig, he devoted himself principally to ancient literature and the studies connected with it. In 1742 he was appointed extraordinary professor of ancient literature in the university there, and in 1756 ordinary professor of eloquence. In 1759 an ordinary professorship of theology was added to his other offices. He performed the duties of these professorships till 1770, when he resigned the former. He died first professor of the theological faculty in 1781. By a careful study of profane philology he had fitted himself for a thorough study of theology, and was thus led to a more judicious exegesis of the biblical writers, and, in general, to more liberal theological views. Theological criticism, so far as it is founded on philology and grammatical illustrations, was greatly promoted by him. Of his accuracy as a critic and grammarian, his editions of Xenophon's *Memorabilia* of Socrates, the *Clouds* of Aristophanes, Homer's Works, Callimachus, Polybius, Suetonius, Tacitus, and, above all, his admirable edition of Cicero's Works (first at Leipzig, 1738), are sufficient proofs. For the elegance of his Latin style he well deserves to be called the *Cicero of Germany*. Of his theological writings the ablest is his *Institutio Interpretis Novi Testamenti* (3d edition, 1775).—His nephew, AUGUST WILHELM (1733–1801), edited the works of Livy (1769), Ammianus Marcellinus (1773), and several other classical writers.

EROS, the Greek name of Cupid and Amor (which see; see also ANTEROS).

EROSION, geological phenomena due to the action of water, such as the hollowing out of river channels.

It is well known that the smallest streams, when flowing over soft strata, scoop out channels and carry away the eroded material; and it is known from observation that huge masses of rock have been gradually worn away at the base, and in courses of time have suddenly given way, often with disastrous consequences.

EROSTRATUS, an obscure Ephesian who, to perpetuate his name, set fire to the magnificent temple of Artemis (Diana), at Ephesus, on the night Alexander the Great was born (356 B.C.). The indignant Ephesians decreed that whoever pronounced his name would be put to death, a sure means of insuring his fame.

EROTIC (from the Greek *erōs*, love), relating to love.—*Erotic Poetry*, amatory poetry.—The name of *erotic* writers has been applied, in Greek literature, particularly to a class of romance writers, and to the writer of the Milesian Tales. These writers belong to the later periods of Greek literature, and abound in sophistical subtleties and ornaments. The best of them are Achilles Tatius, Heliodorus, Longus, Xenophon of Ephesus, and Chariton. The best collection of them—*Scriptores Erotici Græci*—is that of Hercher (Leipzig, two vols. 1858–59).

EREPNIUS, THOMAS (properly *Van Erpen*), a learned orientalist, was born at Gorkum, in Holland, in 1584, and studied at Leyden. His fame rests principally on his acquaintance with the oriental languages, which he began to learn under Joseph Scaliger. To extend his knowledge of them he visited England, France, Italy, and Germany, and became acquainted with the most eminent scholars. He was received with particular marks of friendship by the great Casaubon. He learned at the same time the Persian, Turkish, and Ethiopian languages. After a tour of four years he returned, in 1612, to Leyden, and was appointed professor of Arabic and other oriental languages. He established a press, at great expense, for the printing of works of oriental literature. In 1619 a second Hebrew professorship was founded at Leyden, and committed to Erpenius. Soon after he received the office of oriental interpreter to the states-general. The most learned Arabs admired the elegance with which he expressed himself in their language, so rich in delicate peculiarities. His reputation as a perfect master of the Arabic became universal, and he was repeatedly invited by the King of Spain to explain inscriptions on the Moorish buildings and monuments. The works of Erpenius (some of which were published after his death) are held in the highest estimation. It was his intention to publish an edition of the Koran, with a Latin translation and a commentary, a *Thesaurus Grammaticus* of the Arabic, and an Arabic dictionary; but he was carried off by a contagious disease in 1624, at the age of forty. Beside his *Grammatica Arabica*, his *Grammatica Hebraica*, and other grammatical works, his most valuable and celebrated publication is his *Elmacini Historia Saracenica* (1625, folio).

ERRATA (Latin, the plural form of *erratum*, an error), the list of errors and corrections placed at the end or at the beginning of a book. Before the invention of printing, and for a short time after it, the errata were corrected on the page where they occurred, but this was found to be inconvenient when the art became a little more developed. The first known example occurs in an annotated edition of Juvenal, published at Venice in 1478, which contains a list occupying two pages. The *Vulgate*, published in 1590, at Rome, by Sixtus V., and of which the proofs were revised by that pope himself, contains, instead of a table of errata, a bull which excommunicated those who would dare to make any alterations in the text. The book, however, was found to con-

tain so many blunders that it was afterwards suppressed, and the Papal bull had no other effect than that of amusing the learned and creating a demand for the copies still existing, some of which have been sold for about £50.

ERROR, in astronomy, is the difference between the places of any of the heavenly bodies, as determined by calculation and observation. Thus the error in the lunar tables is the difference between the place of the moon, as given in the tables, and as determined by observation; and this error is marked with the sign + or —, according as it is to be added to or subtracted from the tabular result.

ERSCH, JOHN SAMUEL, the father of modern German bibliography. He was born at Grossglogau, in Lower Silesia, June 23, 1766, and while a mere tyro showed uncommon love for bibliography. Being encouraged in this pursuit by Tabri and other learned men, he published the *Repertory of the German Journals* and other Periodical Collections of Information on the Subjects of Geography, History, and Sciences connected with them (1790–92, three vols.) Becoming known to Schutz and Hufeland, they engaged him in the editing of their *Universal Repertory of Literature* (1785–90). This work was published in 1793, and was followed in 1799 by the *Quinquennial*, extending from 1791 to 1795; and in 1806 by another, extending from 1796 to 1800. These works contain notices of all the separate publications which appeared during that period, and even all the essays printed in the journals and other periodicals. They are executed with accuracy, on a good plan, and with a general account of reviews, whose character for partiality or impartiality is illustrated by examples. At the same time Ersch began to prepare a *Universal Dictionary of Modern Authors*, which he afterwards limited to European writers. This was the origin of his *Gelehrtes Frankreich* (Literary France) (Hamburg, 1797–1806, three vols., with two supplements). In the year 1803 he was made professor of geography and statistics in the University of Halle, where he published his *Manual of German Literature from the Middle of the Eighteenth Century till the Latest Times* (Amsterdam and Leipzig, 1812, two vols. 8vo; 2d edition, Leipzig, 1822), and in connection with Gruber, the *Universal Encyclopedia of Arts and Sciences* (Leipzig, 1818, et seq. 4to). By the former work he first gave a systematic character to modern German bibliography; and its completeness, accuracy, and arrangement make it a model for such a work. Only a small part of the *Encyclopedia* appeared while he lived, and the work still remains uncompleted (See *ENCYCLOPEDIA*). He died in January, 1828.

ERSE. See **GÆRLIC**.

ERSKINE, EBENEZER, the founder of the Secession Church in Scotland, was born on the 22d of June, 1680, and died in 1756. After going through a regular course of study at the University of Edinburgh he was ordained minister of Portmoak, in Fife, in 1703, in which situation he continued for twenty-eight years, when he removed to Stirling. Five volumes of his sermons were printed in 1762 and 1765, 8vo. Regarding his participation in the origin of the Secession Church, the reader is referred to the article **SECESSION**.—His brother **RALPH** was born in 1685, and died in 1752. He was minister of Dunfermline, in Fifeshire, from 1711 to 1734, when he was ejected for secession. His sermons are numerous, and together with his lyrical effusions called *Gospel Sonnets*, were printed in 1750, in two vols. folio. The latter have been often reprinted.

ERSKINE, THE HON. HENRY, a distinguished Scottish barrister, was the third son of Henry David, tenth earl of Buchan, and was born at Edinburgh

on the 1st of November, 1746, o.s. After studying at the universities of St. Andrews, Edinburgh, and Glasgow, he adopted the legal profession, and in 1768 was called to the bar. There he was equalled, perhaps surpassed in depth of legal knowledge, by one or two of his fellows; but none could boast of equal variety and extent of accomplishments; none surpassed him in knowledge of human character; and none equalled him in quickness of perception, playfulness of fancy, and professional tact. Yet while, by the unanimous suffrages of the public, Mr. Erskine found himself placed without a rival at the head of a commanding profession, his general deportment was characterized by the most unaffected modesty and easy affability, and his talents were not less at the service of indigent but deserving clients, than they were to be commanded by those whose wealth or influence enabled them most liberally to remunerate his exertions. He had early embraced the principles of whiggism; and on the accession of the Rockingham administration his merits pointed him out as the fittest member of faculty for the important office of lord-advocate of Scotland, to which he was immediately appointed. But his opportunities to support the new administration were few, on account of its ephemeral existence; and on its retirement he was immediately stripped of his official dignity, and even some years afterwards deprived, by the vote of his brethren, on account of his obnoxious political sentiments, of the honourable office of dean of faculty. On the return of the Liberal party to office in 1806 he once more became lord-advocate, and was returned member for the Dumfries district of burghs. This, however, like the former Whig administration, was not suffered to continue long in power, and with its dissolution Mr. Erskine again lost his office and seat in Parliament. His constitution began to give way under the pressure of disease about the year 1812; and he thereupon retired from professional life to his beautiful villa of Ammondell in West Lothian. The five remaining years of his life were consumed by a complication of maladies; and he expired at his country-seat on October 8, 1817, in his seventy-first year.

ERSKINE, JOHN, of Carnock, afterwards of Cardross, a celebrated Scottish jurist, was born in 1695, was trained for the legal profession, and became a member of the faculty of Advocates in 1719. He continued for some years to discharge his professional duties with much success. In 1737 he was chosen as successor to Alexander Bain in the professorship of Scots law in the University of Edinburgh. In 1754 he published his *Principles of the Law of Scotland*, which he intended chiefly for a text-book for his students, in place of Sir George Mackenzie's *Institutions* hitherto used for this purpose. The book is highly esteemed on account of the precision, accuracy, and at the same time conciseness with which the principles of the law are stated. After a professional career of twenty-eight years he resigned and retired from public life. For three years after his resignation he occupied himself chiefly in preparing his more important work, the *Institute of the Law of Scotland*, for publication. At his death in 1768, however, the work was not completed. It was put into the hands of one of his legal friends, who, with the aid of some of his associates at the bar, brought it out in 1773. It is remarkable for the same accuracy and caution as the *Principles*, and as additions have been made in every subsequent impression, suitable to the changes in the law, the work still enjoys a high reputation, and is often referred to as an authority.

ERSKINE, THOMAS, Lord Erskine, the youngest son of David Henry tenth earl of Buchan, and

brother of Henry Erskine, the witty lord-advocate. He was born in the year 1750, and was educated partly at the High School of Edinburgh, and partly at the University of St. Andrews. The contracted means of his family rendering a profession necessary, he was embarked at Leith as a midshipman, and from this time did not revisit Scotland until a few years before his death. He never obtained a commission in the navy, which he quitted after a service of four years, and entered into the Royals, or 1st Regiment of Foot, in 1768. In 1770 he married, and went with his regiment to Minorca, where he spent three years. He served in the army six years, and during that time acquired considerable reputation for the acuteness and versatility of his talents in conversation; and it is supposed that this circumstance, and the earnest persuasion of his mother—a lady of uncommon acquirements and penetration—induced him, at the age of twenty-six, to embrace the legal profession. He entered as a fellow commoner at Trinity College, Cambridge, in 1777, merely to obtain a degree, to which he was entitled as the son of a nobleman, and thereby to shorten his passage to the bar; and he at the same time entered himself a student of Lincoln's Inn. He also became a pupil in the office of Mr. (afterwards Judge) Buller, then an eminent special pleader, and subsequently in that of Mr. (afterwards Baron) Wood. He was called to the bar in 1778, and his success was immediate. In May, 1783, he received a silk gown, and the same year was elected member of Parliament for Portsmouth. The latter honour he acquired from the reputation he obtained there when acting as counsel on the celebrated trial of Admiral Keppel; and he was unanimously rechosen for the same borough on every succeeding election, until raised to the peerage. The rights of juries he firmly maintained on all occasions, but particularly in the celebrated trial of the Dean of St. Asaph for libel, when Justice Buller refused to receive the verdict of 'guilty of publishing only,' as returned by the jury. In 1789 he found another fortunate opportunity for the display of his peculiar eloquence, in a defence of Mr. Stockdale, the bookseller, for publishing what was charged as a libellous pamphlet in favour of Warren Hastings, whose situation at the time (being then about to take his trial) gave him admirable scope for the animated appeal to feeling, by which his oratory was so felicitously distinguished. In 1792, being employed to defend Thomas Paine, when prosecuted for the second part of his *Rights of Man*, he declared that, waving all personal convictions, he deemed it right, as an English advocate, to obey the call: by the maintenance of which principle he lost his office of attorney-general to the Prince of Wales. The most arduous effort, however, in his professional life, arose out of the part cast upon him, in conjunction with Mr. (afterwards Sir Vicary) Gibbs, in the trials of Hardy, Tooke, and others, for high treason, in 1794. These trials lasted for several weeks; and the ability displayed by Erskine on this eventful occasion was admired and acknowledged by all parties. He was a warm partisan of Fox, and a strenuous opposer of the war with France; on which subject he embodied his sentiments in a pamphlet, entitled *A View of the Causes and Consequences of the War with France*; when such was the attraction of his name, that it ran through the unprecedented number of forty-eight editions. In 1802 the Prince of Wales not only restored him to his office of attorney-general, but made him keeper of his seals for the duchy of Cornwall. On the death of Pitt, in 1806, when Lord Grenville received the commands of George III. to form a new administration, Erskine was created a peer by the title of

Lord Erskine, of Restormel Castle, in Cornwall, and raised to the dignity of Lord High-chancellor of Great Britain; but was soon removed by the dissolution of the brief administration of which he formed a part. In his leisure he amused himself by editing several of the state trials. The preface to Fox's *Speeches* was also written by him, as well as a political romance, in two volumes, entitled *Armata*, and some pamphlets in support of the Greek cause. He died in 1823 of an inflammation of the chest.

The talents of Lord Erskine were peculiarly those of the accomplished advocate; as a senatorial orator his claims were but secondary; nor as a political writer is he entitled to much distinction. Many of Erskine's speeches at the bar have been published under the following titles: *Speeches of the Hon. Thomas Erskine, now Lord Erskine, when at the Bar, on Subjects connected with the Liberty of the Press and against Constructive Treason*, in four vols. (second edition, London, 1813); and *Speeches of Lord Erskine, when at the Bar, on Miscellaneous Subjects* (1810), by Ridgway.

ERUPTION, in medicine, a sudden and copious excretion of humours, and the same with *exanthema*, or breaking out; as the pustules of the plague, small-pox, measles, &c.

ERYNGO (*Eryngium*), a genus of plants belonging to the natural order Umbelliferae. The species are herbaceous, and have something of the aspect of the thistle. *E. maritimum*, sea-holly, is our only truly native species. It frequents sandy shores, and is distinguished from other plants of the order by its rigid, spiny, glaucous, veined leaves, and its dense heads of blue flowers. The roots are sometimes candied, and are reputed to be stimulating and restorative. The *E. campestre* was formerly much employed in Europe as a tonic, and as tending to excite appetite; but its virtues are feeble, and it has now gone out of use, except as a preserve.

ERYSICHTHON, or **ERESICHTHON**, in fabulous history, the son of Triopas, king of Thessaly. He attempted to cut down a grove sacred to Demeter (Ceres). Beginning with a large and beautiful oak, the abode of one of the dryads, under the shade of which the rest of the dryads commonly celebrated their dances, in spite of all previous warnings, in spite of the blood of the nymph, which flowed from the first stroke, he would not relinquish his design till the oak fell, and its spiritual inhabitant was deprived of life. The rest of the dryads now fled to Demeter and implored vengeance. The goddess despatched the demon of hunger, which overshadowed Erysichthon with its wings while he slept, and breathed into him its poisonous breath. From this moment a continual craving for food raged within him. He soon consumed all his possessions, and when food could no longer be procured for him by the art of his daughter, who had many times sold herself for a slave from love to him, and escaped from her purchasers by her power of assuming different forms, which she had received from Poseidon, he devoured his own limbs, as far as he could reach them, and died in a dreadful state of despair.

ERYSIPELAS (from Greek *eruō*, I draw, and *pelas*, adjoining; named from the neighbouring parts being affected by the eruption), the rose, or St. Anthony's fire. This disease is an inflammatory affection, principally of the skin, but also involving the subcutaneous tissues, and tending to spread in various directions. It is an infectious disease, and the infection is specially apt to find victims in those suffering from wounds, or from organic disease, or those in different health, specially if the result of excess in drinking or of bad sanitary conditions. These are

among the reasons for the frequency and extent of epidemics in hospitals, in the days when much less attention was paid to construction, drainage, and ventilation than is now the rule. The skin of the part affected is red, painful, swollen, pits on pressure, and later may become hard and brawny. Blesbs may form on the surface. The inflammation may then subside, passing to another part as it fades from that first attacked. Instead of subsiding the disease may go on to destruction of the skin and tissues beneath it, and extensive areas may be thus destroyed. Constitutional symptoms attend the disease, fever, headache, backache, loss of appetite, &c. Delirium is not uncommon, and great prostration of strength is a marked feature. Relapses are not infrequent, and one attack predisposes to another. The treatment is by nourishing stimulating diet, and frequent doses of tincture of steel, while the part is protected by a thick layer of cotton-wool. A micrococcus (*Streptococcus pyogenes*) has been found associated with erysipelas, and an anti-toxin for the disease has been prepared.

ERYTHRIC ACID, or **ERYTHRIN** ($C_{26}H_{40}O_{10}$), is got from *Rocella tinctoria* and allied lichens by extracting with boiling water or milk of lime. It is a white, crystalline, tasteless, and odourless powder, readily soluble in alkalies, alcohol, &c., not so readily in water. It is decomposed by heat, and yields, when boiled with water or alkalies, picroerythrin and orsellinic acid. With alcohol, in the absence of water, it yields, on boiling, picroerythrin ($C_{26}H_{40}O_7$) and orsellinate of ethyl; if water be present, orcinol and carbon dioxide are also formed. It acts as a very weak acid, forming feeble compounds with the alkalies, and reacting with salts of iron, lead, and other metals.

ERYTHRINE, a name given to cobalt bloom, from its carmine or peach-blossom colour. It consists of arseniate of cobalt, but contains considerable quantities of nickel, iron, and water. It is soluble in acids, and fuses readily in the blowpipe flame. It is found both in small crystals belonging to the oblique system and in masses; the colour varies from red to white or greenish gray, and when dry deep blue; translucent or transparent. Specific gravity 3. Its English localities are Cornwall and Cumberland; it is also met with in different parts of the Continent. It is used for conversion into smalt (which see).

ERYTHRITE, or **PHYCITE** ($C_4H_4(OH)_4$), a tetrahydric alcohol obtained from certain lichens.

ERYX, a city and mountain in the west of Sicily, about 6 miles from Drepanum, and 2 from the seacoast. The mountain, now Monte San Giuliano, rises direct from the plain, unconnected with any other range, and hence possesses a much greater altitude in appearance than in reality, its height being only 2184 feet. It was anciently believed to be the highest mountain in the island after Etna, and is frequently alluded to by Virgil and other poets. On the summit stood a celebrated temple of Venus, from which the goddess received the epithet of *Venus Erycina*. All traces of the ancient town of Eryx have now disappeared, and its site is occupied by the modern town of San Giuliano; but some remains of the temple still exist in part of the substructure of the castle.

ERZERUM, **ERZERBOUM**, or **ERZERROOM**, a city of Turkish Armenia, and, since the annexation of Kars by Russia, the chief strategical centre and place of resistance to a Russian advance, about 100 miles s.w. of Trebizond. It consists partly of an inner portion, near the centre of which stands the citadel, surrounded by a double stone wall, and of several extensive suburbs. Many of the houses are substantial, though a number of them are more indicative of ancient than of ex-

isting splendour; the streets are almost without exception narrow, dark, and filthy in the extreme. The principal edifices are about forty mosques, including one that was originally a Christian church, all situated in the citadel, several Armenian churches, numerous elegant caravansaries, and very extensive and well-furnished bazaars. The inhabitants, who number about 60,000, consisting of Turks, Armenians, and Persians, are very industrious; and, in addition to important manufactures, especially in copper and iron, carry on a very extensive trade. This is greatly favoured by the position of the town, standing at the junction of several important roads leading from Transcaucasia by way of Trebizond, and communicating with different parts of Asia Minor, with Persia, Kurdistan, Mesopotamia, &c. The value of British goods imported into the town in 1898 was estimated at £49,000. Erzerum is a place of great antiquity. Anatholius, commander of the Emperor Theodosius II., here built the citadel of Theodosiopolis, north-west of the open Syro-Armenian trading town of Arsen. On the destruction of this town by the Seldjucks, in 1049, the inhabitants removed to Theodosiopolis, which received from them the name of Arsen-er-Rum, that is, Arsen of the Romans. Hence the modern name Erzerum. In 1241 it fell into the hands of the Mongols, and in 1517 into those of the Turks, notwithstanding whose mismanagement it continued to be the most important commercial emporium of the Armenian plateau, and had a population of 100,000. In 1829 it was taken by the Russians, but was restored to Turkey by the Peace of Adrianople. Many of the inhabitants, however, quitted the town and settled on the Russian territory. In the winter of 1877 it was besieged by the Russians, who reduced the defenders by famine, until in February 1878 it was surrendered, and held by the Russians for several months. It was again, however, restored to the Turks.

ERZGEBIRGE (Ore Mountains), a chain of mountains running between Saxony and Bohemia, till they meet the Riesengebirge, on the frontiers of Silesia. The highest summits, which are on the side of Saxony, rise to 3900 or 4000 feet above the level of the sea. The Erzgebirge consist chiefly of gneiss and granite formations, and in this the principal beds of ore are to be found. Masses of porphyry and basalt are found on and in this formation. Towards Saxony beds of clay slate rest on the granite and gneiss; and above the clay slate are granite and syenite. Towards Bohemia the primitive formation is covered for a considerable extent by brown coal mountains, and the remainder by clay slate. These mountains are rich in mines of silver, iron, copper, lead, cobalt, arsenic, &c.

ESAU, the eldest son of Isaac, and twin-brother of Jacob (Gen. xxv. 24-26). His name (which signifies rough, hairy) was due to his singular appearance at birth, being 'red, and all over like an hairy garment.' The struggle for precedence between the brothers was foreshadowed the moment of their first appearance in the world. The two boys grew up, and the disparity of their tastes was soon apparent. Esau, the father's favourite, became a cunning hunter; Jacob, the favourite of the mother, became a peaceful shepherd. One day, as Esau returned famished from the chase, he found his brother preparing some lentil pottage, and asked for a share of it. Jacob, taking advantage of his brother's distress, offered him the pottage if he would give up his birthright. This meant yielding up the headship of the tribe and the greater share of the family property, but Esau was so exhausted that he consented. He was named Edom (red) in consequence, from the colour of the pottage; and the name was given to the land

he settled in. Esau married at the age of forty; and, against the wishes of his parents, took both his wives from among the daughters of Heth, of the Canaanite tribe. The next episode in his history is when Jacob, instigated by his mother, personates Esau, and by a series of lies, and the offering of savoury food, which the now infirm and blind old man loved, succeeded in getting his father's covenant blessing. The indignation of Esau at the base trick was natural; and Rebekah sent Jacob out of the way for a time, to escape his brother's vengeance. On his return from a protracted stay Jacob met his brother at the head of 400 warriors, and succeeded in mollifying him by presents and flattery. After a subsequent meeting of the brothers, on the death of their father, we hear no more of Esau.

ESCALADE, in war, a furious attack of a wall or a rampart, carried on with ladders, to pass the ditch or mount the rampart, without proceeding in form, breaking ground, or carrying on regular works to secure the men.

ESCAPE, in law, is where a person arrested gains his liberty before he is delivered by law. Escapes are either in civil or criminal cases; and may be distinguished into voluntary and negligent; voluntary, where it is with the consent of the keeper; negligent, where it is for want of due care. Since the abolition of imprisonment for debt, escapes in civil cases are practically obsolete. Formerly a voluntary escape of a debtor rendered the sheriff liable for the debt, but in the case of a negligent escape he was excused if he retook the prisoner before action was brought against him. In criminal cases, an escape of a person arrested is an offence punishable by fine or imprisonment. Those negligently permitting a criminal to escape are punishable by fine, but those voluntarily permitting the escape are regarded as guilty of the same kind of offence as the prisoner, and are punishable to the same extent.—An *escape warrant* is an instrument addressed to all sheriffs, &c., to retake an escaped prisoner.

ESCAPEMENT, in clock and watch making, the apparatus which connects the train of wheels with the regulator (the pendulum of a clock or the balance-wheel of a watch), and serves to arrest at each instant the onward motion. The *crown-wheel* or *verge* escapement is the oldest form, and is still used in common watches. It consists of a *scape-wheel* (the last wheel in the train), with saw-like teeth rising upwards from the plane of the wheel, and fitting into two pallets attached to the verge or arbor of the balance; these pallets being placed at a distance from each other equal to the diameter of the balance-wheel, and in different planes, receive alternately from the scape-wheel an impetus in opposite directions, which keeps up the vibratory motion of the balance. The *crutch* or *anchor* escapement, introduced into the art of clockmaking in 1680, by Clement, a London maker, consists of a piece of metal shaped like an anchor, with pallets at each end fitting into the scape-wheel. This anchor is attached to the rod of the pendulum, and moves with it; and the pallets are so arranged that the one tooth escapes from contact with the inside of one pallet while the tooth on the opposite side is brought to bear on the outside of the other. The *dead-beat* escapement, invented by Graham, is a modification of this form, in which the pallets are so placed that the outer surface of the one and the inner surface of the other are arcs of circles whose centre is the pivot on which the anchor works. Other inventions, such as the *detached* escapement, the *pin-wheel* escapement, in various forms, and the *gravity* or *remontoir* escapement (in the great clock in the Houses of Parliament), though very efficient, have not yet come into general use, partly owing to com-

plexity introduced into the movement, the extreme delicacy of the work not adapting it to the jostlings of every-day wear, and partly owing to the great expense in repairing the movement when it gets out of order. See CLOCK-WORK, WATCH.

ESCHERAT, in law, a species of reversion arising from default of heirs: when the tenant dies without lawful or natural born relations on the part of any of his ancestors, or on the part of those ancestors from whom the estate descended, or where the intestate tenant, having been a bastard or denizen, does not leave any lineal descendants, the estate reverts back to the original grantor or lord of the fee. Escheat also arose from corruption of blood, when the tenant had been attainted of treason or murder; this is now abolished by 33 and 34 Vict. cap. xxiii., and now a descent can be traced through an attainted ancestor. Escheat, in Scotland, is of two kinds:—1. The forfeiture of all heritable and movable property to the crown, in case of treason; 2. The forfeiture of goods by a debtor, who has failed to make payment of debt in obedience to legal diligence. This last species is now abolished. Single escheat (that is, the forfeiture of movable goods) still exists in Scotland, as a punishment of crime.

ESCHENBACH, WOLFRAM VON, who flourished in the first half of the thirteenth century; one of the most voluminous and also one of the most distinguished German poets of the Suabian period. Of a lively imagination and penetrating spirit, rich and original in his descriptions, and a complete master of language and versification, he elevated himself to a high rank among epic poets. Nothing is known of his private circumstances, except that he belonged to a noble family, probably in the Upper Palatinate. He was knighted at Henneberg, and passed his life in the performance of the duties of chivalry, being supported by his poetical genius and the liberality of princes. He distinguished himself among the minnesingers of the Wartburg. Towards the end of his life he returned to the castle of his fathers, and was buried in the church of Our Lady of Eschenbach. His poems are partly original, and partly imitated from the French and Provençal literature. The most esteemed of his numerous works are: The *Parzival* (printed 1477, 4to, found also in Müller's Collection); the *Titurel*, or the *Guardian of the Graal*, called the *Older Titurel*, to distinguish it from a later poem of the same name (printed in 1477, 4to); and the *Willehalm*, a poem on the deeds of William of Orange, a contemporary of Charlemagne. Lachmann's is an excellent edition of the complete works of Wolfram.

ESCHWEGE, a town of Prussia, in the province of Hesse-Nassau, in a beautiful valley on the Werra, 26 miles S.W. of Cassel. It is a walled and well-built town, with a castle, long the residence of the landgraves of Hesse-Rotenberg; three churches, a townhouse, and infirmary, manufactures of woollen and linen cloth, several large tanneries and glue-works, oil and other mills, and a trade in meal, fruit, lard, ham, and sausages. Pop. (1895), 10,285.

ESCHWEILER, a town of Prussia, in the province of Rheinland, 9 miles S.W. of Aix-la-Chapelle, at the confluence of the Inde and Dente, and on the railway to Cologne, with manufactures of articles in iron and tin-plate, zinc and copper, machinery, boilers, railway plant, needles, wire, rolling-mills, smelting furnaces, &c. Calamine and lead, as well as productive coal-mines, are worked in the vicinity. Pop. (1895), 19,440; (1900), 21,895.

ESCORT, a guard, a body of armed men which attends an officer or baggage, provisions or munitions, conveyed by land from place to place, to protect them. This word is sometimes used for naval protectors; but the proper word in this case is *convoy*.

ESOURIAL (*el Escorial*), a royal palace of Spain, distant from Madrid about 24 miles in a north-westerly direction, and situated on the acclivity of the Sierra Guadarrama, the range of mountains which divides New from Old Castile. The Escorial is not a mere palace, but a memorial building, and combines a monastery, a church, and a mausoleum with a royal palace. Everything about the Escorial—situation, plan, and purposes—bears the stamp of the singular and unpractical mind of its originator, Philip II. Not the least remarkable of its peculiarities is its site. Away from cities, amid the seclusion of mountain scenery, it stands at a height of 2700 feet above the level of the sea. Of its site Thomas Roscoe says, 'Secluded in a recess of these savage mountains, midway up their steep acclivity, it seems to be one of those edifices raised by enchantment in unfrequented spots to amaze and bewilder the traveller. Yet it is not out of harmony with the scene. Gloomy in its site, it is itself gloomy, and calculated to beget that feeling in all who behold it. From a distance it looks like a forest of domes, towers, spires, and pinnacles.' Among the singularities of the Escorial, its origin and plan require particular notice. It was built by Philip II. in commemoration of the battle of St. Quentin. This battle was fought on the festival of St. Lawrence, 10th August, 1557, and the Escorial was built in honour of the saint, in consequence, it is said, of a vow made by Philip previous to the battle. In carrying out his vow Philip had the whimsical notion of making the Escorial resemble the instrument of torture wherewith, according to legend, St. Lawrence was martyred—a gridiron. He appropriated, according to Roscoe, 'to himself the handle, and the remainder to the monks, to intimate possibly that he would much rather they should be grilled than he'. The building is a rectangular parallelogram measuring 744 feet in length by 580 in breadth. The interior is divided into courts, which represent the intersections of the bars of the gridiron; while a projection 460 feet in length, representing, as has been said, the handle, contains the chapel and the royal palace. The building was begun in 1563 by Juan Bautista de Toledo, a Toledan architect, and finished in 1584 by his pupil Juan de Herrera. It is irregular in its proportions, and thus loses much of the effect which, from its great magnitude, it ought to have. 'The height', says Roscoe, 'is 51 feet 8 inches to the cornice by exact measurement (less than a fourteenth of its length), which gives it the appearance rather of the side of a street than of the façade of a palace.' At the extremities are towers 200 feet high, supposed to represent the feet of the gridiron, and the cupola of the church has a height of 320 feet. It is to these features that the building owes an imposing architectural appearance. The innumerable windows (said to be 11,000 in honour of the Cologne virgins) give it the aspect of a large mill or barrack. The doors are also numerous. The material of the building is gray granite found in the neighbourhood, which preserves its fresh and clean appearance. The church, situated immediately in front of the palace, is 320 feet long and 280 broad; and under it is the Pantheon or burying-place of the kings of Spain. Its interior is lined with dark marble beautifully veined. The monasterial part of the building contains a valuable library, especially rich in Greek and Arabic manuscripts, and there is a superb collection of pictures scattered through various parts of the building. Raffaele, Titians, Rubens, Velasquez, Guido, and other great masters are here represented. During the French occupation the books, 30,000 in number, were removed to Madrid, but were sent back by

Ferdinand minus 10,000 volumes. The Escorial was partly burned in 1671, when many MSS. were destroyed. It was pillaged by the French in 1808 (when the books were removed) and in 1813. It was restored by Ferdinand VII., but the monks, with their revenues which supported it, have long since disappeared, and the building, which from its situation requires to be kept in repair at considerable expense, has fallen into some decay, though repairs are executed from time to time. On 2nd October, 1872, it was struck by lightning, and was in consequence seriously injured by fire. The monastery portion of it is now a seminary in which 180 youths receive a secular education. The Escorial is 32 miles by railway from Madrid.

ESCUTCHEON, in heraldry, is derived from the Old French *escusson*, French *écusson*, and that from the Latin *scutum*, a shield. It signifies the shield whereon coats of arms are represented. See **HERALD**.

ESDRAELON, PLAIN OF, a great plain extending across Central Palestine from the Mediterranean to the Jordan, in the form of a triangle. It is drained by the River Kishon, which flows westward to the Mediterranean. The plain of Esdraelon is remarkable for the richness of its soil, and after having fallen almost out of cultivation, again bears rich crops. This plain is celebrated for some important events in Old Testament history.

ESDRAS, BOOKS OF, two books, which, in the Vulgate and other editions, are incorporated with the canonical books of Scripture, but by Protestants are put in the Apocrypha. In the Vulgate the canonical books of Ezra and Nehemiah are called the first and second, and the apocryphal (or 'deutero-canonical') books the third and fourth books of Esdras. The subject of the first book of Esdras is the same as that of Ezra and Nehemiah, and in general it appears to be copied from the canonical Scriptures. The second book of Esdras is supposed to have been either of much later date, or to have been interpolated by Christian writers. It belongs to what are called the apocalyptic class of Jewish writings, of which the canonical types are the book of Daniel and the Revelation of St. John.

ESHER, a village of England, in Surrey, 15 miles south-west of London. Claremont Palace, where the Princess Charlotte resided and died, and the remains of a celebrated mansion, called Esher Place, once occupied by Cardinal Wolsey, are in the neighbourhood. About a mile to the north is Sandown Park race-course. Pop. of parish (1891), 2282.

ESK (that is, water). There are seven small rivers in Scotland of this name, viz. the Esk, the Black Esk, and the White Esk in Dumfriesshire; the North Esk and South Esk in Forfarshire; and the North Esk and South Esk in Edinburghshire. The Forfarshire South Esk, which enters the sea at Montrose, and helps to form its harbour, is the longest (49 miles). The eastern district of Dumfriesshire is called Eskdale.

ESKIMOS. See **ESQUIMAUX**.

ESKI-SAGRA, a town of Eastern Roumelia, on the south slope of the Balkans, 70 miles north-west of Adrianople. It has manufactures of carpets, coarse linen, and leather, extensive gardens of roses, orchards, and mineral springs. It suffered severely in the Russo-Turkish war of 1877-78. Pop. (1901), 19,428.

ESNEH, **ESNE**, or **ESNA** (Coptic, *Sne*), a town of Upper Egypt, in the Thebaid, on the left bank of the Nile, 28 miles s.w. of Thebes. Esneh stands on the site of the ancient Latopolis, which seems to have been a place of considerable extent, but is not represented by architectural remains of much import-

ance. Among the ruins there is a beautiful portion of twenty-four columns, belonging to a temple the rest of which is buried beneath the houses of the modern town. The ceiling contains a zodiac, which resembles that of Denderah (which see). The temple of Esneh, formerly considered one of the most ancient buildings of Egypt, is comparatively modern. Champollion himself drew this conclusion from the rudeness and stiffness of the bas-reliefs and hieroglyphics, as well as from the inscriptions. 'The latter contain merely the names of different Roman emperors. The real age of the *pronaos* of Esneh,' says M. Champollion, 'is therefore not of a more remote period than the reign of the Emperor Claudius; and the sculptures, among which is the famous zodiac, are as late as the time of Caracalla.' Other antiquarians have taken the same view. Esneh is the entrepôt of the Senaar caravans. It has a cotton-spinning mill, shawl manufactures, and potteries. The modern town is a poor place. Pop. 10,000.

ESOP. See *ÆSOP*.

ESOTERIC (Greek, *esōterikos*, inner), a term used in opposition to *exoteric*. In reference to the teaching of Pythagoras, Aristotle, and other ancient philosophers, it refers to those doctrines which they expounded to their select disciples, in contradistinction to those which they published to all the world (*exoteric*). The distinction does not necessarily imply that the esoteric doctrines were kept secret as a mystery, but only that they were of a higher and more difficult order, requiring more preparation and preliminary study for their reception. See *ARISTOTLE*.

ESPAÑOLETTO. See *SPAGNOLETTO*.

ESPALIER (French; from Italian *spalliere*, a support for the shoulder). This term is used by the French to signify a row of trees planted along a wall, and fastened to it by a palisade or trellis, or even with nails. In English it is applied to an artificial framework of wood, iron, or other material, used in place of a wall to train trees or shrubs upon; also to a row of trees so trained which may be planted so as to form a regular hedge-row.

ESPARTO (Greek, *espartos*; Latin, *spartum*), a plant growing native in Spain and Africa, known to the ancients, and applied by them to the manufacture of cordage, matting, &c., and still more extensively used at the present day. This plant, called by botanists *Stipa* or *Macrochloa tenacissima*, is a species of grass, and is found chiefly in the southern provinces of Spain. It grows in tufts and bunches, like rushes, to a height of from 2 to 4 feet, and has a long, flat, lanceolated blade, which becomes cylindrical when the ripened plant begins to dry. It is pulled up by the roots, dried in the sun, and packed in bundles for exportation. Besides the various uses already indicated, esparto has for some time been applied to the manufacture of paper, for which various patents have been taken out. The paper made from esparto is said to have some points of superiority over that made from other materials. The fibres of esparto are specifically lighter than those of almost any other material used in this manufacture; it admits of minute subdivision without destroying the lighter or downy fibres, and has thus superior qualities for felting; this also enables it to take a finer surface than paper made from the ordinary material. Formerly the supply of esparto was almost wholly obtained from Spain, but a closely allied fibre called *alfa* (*Macrochloa arenaria*) is now obtained in still larger quantity from Algeria, while a third fibre, dis (*Pectua patula*), is imported for the same purpose from Tripoli and Tunis. The total import of these fibres into Britain in 1899 was 207,804 tons, value £806,354.

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ESPINASSE, JULIE JEANNE ÉLÉONORE. See *L'ESPINASSE*.

ESPIRITO-SANTO, a state of Brazil, bounded north by Bahia, west by Minas-Geraes, south by Rio-de-Janeiro, and east by the Atlantic; length, about 260 miles; breadth, about 120 miles; area, 17,312 square miles. It is tolerably well peopled along the coast, but the interior, understood to be covered with lofty mountains and impervious forests, and almost entirely in the hands of wild Indians, is very imperfectly known. The chief rivers, the Ienevente, Cabapua, Caralipe, Doce, Guandu, &c., all flow east to the Atlantic in courses nearly parallel. The climate is generally healthy and the soil fertile, though little cultivated. Sugar, rum, cotton, dye-woods, &c., are exported, but not in large quantity. According to an official return the population of this state in 1890 was 135,997.

ESPLANADE, in fortification, a term formerly used for the glacis of the counterscarp, now more correctly designates the wide open space left between a citadel and the nearest houses of the city, to prevent an enemy from being able to assail it under cover of these houses.

ESPOUSALS, in Scotch law, a solemn engagement or contract between a man and woman to marry each other. By the law of Scotland all contracts relating to marriage may be rescinded from unless a *copula* has followed, which completes the marriage, but the party is liable to damages in *solatium* of his or her injured feelings.

ESQUIMAULT, a harbour and naval station on the south-east coast of Vancouver Island, about 3 miles from Victoria, the capital of British Columbia. The harbour is almost landlocked, and with the roadstead is capable of giving safe anchorage to a fleet of vessels of the largest size. Since the construction of the Canadian Pacific Railway its importance has become apparent, and it is being fortified and provided with all the necessaries of a first-class naval arsenal and coaling station. A railway connects it with the coal-mines of Nanaimo.

ESQUIMAUX, or ESKIMOS, the name commonly given to a race inhabiting all the coasts of North America, from Greenland to Behring's Straits, north of lat. 60°. It is not the native name, and is even said to be unknown to the Esquimaux, who call themselves *Inu-it*, the people. The Esquimaux are considered by many ethnologists as of Mongolian origin; while others find in them strong resemblances to the Red Indians. They consist of three principal stocks—the *Kalalits*, better known by the name of Greenlanders; the Esquimaux proper, on the north and east coast of Labrador; and the Western Esquimaux, found along Hudson's Bay, the west side of Baffin's Bay, the polar shores of America, and both on the American and Asiatic sides of Behring's Straits. Their leading physical peculiarities are a stunted stature, flattened nose, projecting cheek-bones, eyes often oblique, and yellow and brownish skin. The Greenlanders are less than 5 feet in height, broad-shouldered, with large heads, round, flat cheeks, small noses, high cheek-bones, small mouths, and long, straight, black hair. Their skin is distinguished by a brown colour; but it is doubtful if this is natural, as they use much oil and little water. The dress of the men consists of a coat or tunic and trousers or breeches all of seal-skin, and that of the women differs from it only in a few minute points, often scarcely discernible. Reindeer and other skins or furs are also used as material for dress, according to the season, including skins of otters, foxes, martens, &c. The natives show great skill in adapting these materials. In summer they live in tents, covered with the skins of reindeer and other animals; in winter they

may be said to burrow beneath the snow. In Greenland, houses built partly of stone and partly of turf are used as permanent habitations. They are usually not more than 6 or 8 feet high. In Labrador the houses are usually sunk 3 feet in the ground. Vegetation being extremely stunted within the limits of the territories of the Esquimaux, their chief dependence for food is on fishing, particularly on fishing for the seal, which seems to be as essential to them as the reindeer to the Laplanders. The most valuable possessions of an Esquimaux are his boat and his sledge. Owing to the rigour of the climate they eat flesh and fish raw, and consume much fat and oil, which are considered delicacies. Their weapons are bows and arrows, and spears or lances, generally pointed with stones or bones, but sometimes also with copper. Their language consists of long, compound (polysynthetic) words, and has regular, though remarkable, inflections. In grammatical structure, at least, it is American. In intellect they are by no means deficient, and show a considerable aptitude for instruction; in manners they are kind and hospitable, love freedom, and manifest a deep attachment to their homes and native land. They are said by some travellers to be scrupulously honest in their dealings with one another, but totally regardless of the rights of strangers. Their religious ideas appear scanty, but the success which ultimately attended the labours of the Danish missionaries in Greenland, after they had almost begun to despair, proves their capability of receiving Christianity, of understanding its truths, and conforming to its precepts. See ETNOLOGY.

ESQUIRE (from the Latin *scutum*, a shield, through the old Fr. *escuyer*), anciently, the person that attended a knight in the time of war, and carried his shield. Originally it was a title of chivalry due to personal service, and not conferred by the holding of property. It is still legally regarded as a special prerogative of certain classes, but by popular application it first came to be conferred as a token of respect upon untitled holders of property. This popular use of the title is frequently accompanied with the name of the estate in virtue of which it is conferred—A., esquire of B., indicating the popular belief that the title is the rightful distinction of a holder of property. Like all other titles of mere courtesy, the popular use of the title esquire has become gradually more general until it is now little more than an equivalent for Mr. when used in epistolary correspondence and otherwise. Those to whom the title of esquire is due in England are said to be: all noblemen's younger sons, and the eldest sons of such younger sons; the eldest sons of knights, and their eldest sons; the heads of ancient families by right of prescription; esquires by creation or office, namely, judges, officers of state, justices of the peace (during office), barristers, doctors of the several faculties, and some other officers who hold the title by courtesy; esquires appointed by knights of the Bath (a class now extinct). (See fig. of esquire's helmet at HERALDRY.)

ESQUIROL, JEAN-ETIENNE DOMINIQUE, a French physician, born in Toulouse in 1772. After studying at Paris he returned to Toulouse and entered the hospital of La Grave, whence he was sent, at twenty-two years of age, as a sanitary officer to the army of the Pyrénées-Orientales. In 1805 he received the degree of M.D. from the University of Paris, and after visiting the lunatic asylums of France he was, in 1811, appointed physician to the Salpêtrière, where he distinguished himself as well by his clinical demonstrations as by the ameliorations he introduced in the condition of the insane. In 1823 he was made inspector-general of the faculty of medicine, and in 1834 correspondent of the Academy of Moral Sciences. He died 12th December, 1840. Among his works

are: *Des Passions considérées comme Causes, Symptômes et Moyens Curatifs de l'Aliénation mentale* (1805); *Des Établissements d'Aliénés en France* (1819); *Des Maladies mentales Considérées sous les Rapports médical, hygiénique et médico-légal* (1838).

ESSAY, a composition in which something is attempted to be proved or illustrated. It is not easy to define the limits of the essay as a species of composition. In general it is understood of the briefer and less elaborate efforts of literary skill; but this distinction is not always maintained. Caution or modesty has induced many writers of note to give the title of essay to their most elaborate productions; thus we have Locke's *Essay on the Human Understanding*. Still, an essay, however elaborate in execution, is generally understood to mean a composition having a definite and specific object more limited in its range than a formal exposition of any art or science. The subject of an essay may be any topic of human interest; it may be philosophical, scientific, logical, ethical, æsthetic, or humorous; and a series of essays may embrace connected, but so far independent views of the most extensive range of subjects. There is a class of English writers to whom the descriptive term *essayist* is applied. The Spectator, The Tatler, The Rambler, and many other extensive collections of brief treatises embracing every variety of subjects, are among the works of this class of writers, the best of whom, from the variety which their works present in other particulars, can only be distinguished by excellence of style. From the brevity of the essay, considered in its ordinary sense, and the necessity of giving it some specific claim on the attention of cultivated readers, style may possibly be considered to have been, at least until recently, the distinctive characteristic of essay writers, and this form of composition may be supposed to have done some service in maintaining the standard of purity and excellence in our language. In recent times circumstances have somewhat changed. The vastly extended range of modern inquiry has opened up innumerable subjects for brief and tentative compositions, in which the matter is of infinitely more importance than the style; and the vast number of our serial publications subjects to so incessant a drain the powers of our popular writers, that, whether in matters of science or taste, mere style can hardly be said to receive as much attention now as formerly.

ESSAYING. See ASSAYING.

ESSEK. See ESZEK.

ESSEN, a town of Germany, in the Prussian province of Rheinland, in a district rich in coals, about 2 miles from the Ruhr, 18 miles north-east of Düsseldorf. It has a fine old church, partly dating from the tenth century and recently restored, and has many excellent modern buildings, being almost entirely a place of recent growth. Its industries include manufactures of machinery, steam-bollers, tobacco and cigars, &c., tinplate works, puddling works, rolling-mills, coal-pits, dye-works, breweries, &c.; but it is above all celebrated for the steel and iron works of Krupp, the most extensive in Europe. In 1899 there were over 25,000 workmen employed in Krupp's works at Essen, while the total number of persons in the employment of the firm here and elsewhere was 41,750. This great establishment was begun in 1810 under the grandfather of the present proprietor, and became highly flourishing under the management of his son, Alfred, who succeeded in casting steel in larger blocks than had hitherto been considered practicable. At the London Exhibition of 1851 he exhibited a block of over 44 cwts. At that time a ton was considered an extraordinary size. This opened up new applica-

tions of cast-steel, of which Krupp himself made prompt use, as was shown in the exhibitions of Munich (1854), Paris (1855), and London (1862). There is now hardly any practical limit to the size of the blocks that can be cast by the Krupp method. The works occupy 1000 acres, and comprise 60 miles of railway and 50 miles of telegraph line, besides other means of transport and communication between the different parts of the works. There are over 100 steam-hammers (one of them being 150 tons), and over 450 steam-engines. The annual consumption of coal and coke is over 1,000,000 tons, the daily output of the firm's mines being about 3500 tons. The firm possesses coal-mines, blast-furnaces, many ironstone pits in Germany, besides beds of iron ore in the north of Spain, near Bilbao, and has a ship building yard at Kiel, machine works at Berlin, besides other works. All the processes of iron and steel manufacture are carried on at Essen. The works are specially famous for rifled steel cannon, which are supplied to most of the armies of Europe. The workmen subscribe part of their pay to the hospital fund, and the whole subscriptions are doubled by their employer. A workman who meets with an accident in the works receives full pay till his recovery. After 25 years' service the workmen receive a pension. Pop. (1890), 78,723; (1895), 96,128; (1900), 118,863.

ESSENES, or **ESSAENS**, a sect or voluntary association among the Jews, the origin of which is unknown, as well as the etymology of their name. The sect appears to have sprung up in the course of the century preceding the Christian era, and it disappeared on the dispersion of the Jews after the siege of Jerusalem. The Essenes appear to have been an outcome of Jewish mysticism and asceticism, and gradually assumed the form of a distinct organization. They seem to have consisted of four orders, and to have had various initiatory rites and ordeals. They had an extremely strict rule of life, analogous to that of a monastic order. They were unusually strict in observing the Sabbath and the law of Moses, and though they did not themselves offer sacrifices, they sent presents to the temple at Jerusalem. Levitical purity, the avoidance of anything polluting, was carried by them to the extent of a craze. Their food was of the plainest, prepared according to the most stringent regulations, and their meals were taken in common, their goods being owned in common. Besides particulars contained in the Talmudical writings of the Jews, the chief authorities regarding them are Josephus, Philo, and Pliny. The Essenes had a longer vitality in Egypt than elsewhere. Here they seem to have merged in the sect of mystics called *Therapeutae*. The most extreme among them practised celibacy. Their doctrines differed little except in extreme strictness from those of the Pharisees.

ESSENTIAL OILS. See **OILS (ESSENTIAL)**.

ESSEQUIBO, a river which flows northwards through the whole of British Guiana into the Atlantic. It is 20 miles wide at its mouth, but difficult of navigation on account of the sand-banks which run in different directions across its entrance. Its course is much impeded by cataracts, and its estuary contains a number of islands. Its total length is about 600 miles, and among the largest of its tributaries are the Rupununi, the Potaro (on which is the Kaieteur fall), and the united Cuyuni and Mazaruni.

ESSEX, a maritime county in England, *s. coast*, bounded *n.* by Suffolk and Cambridge, *e.* by the Thames, *w.* by Hertford and Middlesex, and *s.* by the German Ocean; 62 miles in length, *s.w.* to *n.e.*; greatest breadth, about 45 miles. The coast-line is

very irregular and indented, and is fringed by a number of islands. Area, 1,055,183 acres, of which nearly 80 per cent is under cultivation. About one-third of the total area is under corn crops, chiefly wheat and barley, one-tenth under green crops, mainly mangolds and turnips, and one-quarter is in permanent pasture. The principal rivers in the county are the Roding, Crouch, Chelmer, Blackwater, Colne, &c. It has also the Thames, Lea, and Stour as boundary rivers—the first on the *s.*, the second on the *w.*, and the third on the *n.* The surface, though generally level, is in many parts diversified by gentle hills and dales, especially towards the north-west, where there is a continued inequality of surface. The most level tracts are those of the south and east hundreds, where there were once extensive marshes, which are now generally well drained, and converted into excellent grassland. Agriculture is in a forward state here, the farmers of Essex being reckoned amongst the best in the kingdom; but the industry has suffered severely from the prevalent agricultural depression. The soil is in general extremely fertile, and particularly well adapted for the growth of corn, as the superiority of the Essex wheat sufficiently proves. Beans and peas also thrive uncommonly well, perhaps better than on any other land in England. The other principal productions are potatoes, barley, oats, mangolds, turnips, taro, rape, mustard, and trefoil. The raising of caraway, coriander, and tassel, is almost peculiar to this county. There is no particular breed of cattle here. Grazing is chiefly confined to the marsh lands. The suckling of calves, for which Essex is celebrated, is carried on to a great extent. They are fattened for about three months, when they are slaughtered for the London markets. Among the dairy farms those in the parish of Epping and vicinity have been long famous for the excellence of their cream and butter. The size of farms varies greatly, but averages from 150 to 200 acres. Fish are plentiful on the coast and in its various creeks. Near Colchester, and about Mersey Island, and on the Crouch and Roach rivers, are some valuable oyster-beds, the oysters from which are exported in considerable quantities. The manufactures of the county are not very extensive, with the exception, perhaps, of the silk-mills and crape factories at Braintree and several other towns. Many of the industrious poor are employed in making straw plait for the London market. This county is traversed from south-west to north-east by the Great Eastern Railway. The chief towns are Chelmsford, the county town; Colchester, Maldon, and Harwich. The county is divided for the purpose of parliamentary representation into eight divisions, each returning one member to the House of Commons. The parliamentary boroughs are West Ham (2 members) and Colchester (1). Pop. in 1881, 575,930; in 1891, 785,445; in 1901, 1,085,576.

ESSEX, EARL OF. See **CROMWELL (THOMAS)**.

ESSEX, KINGDOM OF. See **ENGLAND**.

ESSEX, ROBERT DEVEREUX, SECOND EARL OF, eldest son of the first earl, was born at Netherwood, Herefordshire, on Nov. 10, 1567. He was educated at Trinity College, Cambridge, and appeared at court in 1577. In 1587 he was made Master of the Horse, and in the following year Knight of the Garter. He served as captain-general of the cavalry under Leicester in the Netherlands in 1587. On Leicester's death in the following year he became the chief favourite of Elizabeth. In 1589 he joined, without leave from the queen, the expedition of Drake and Norris to Portugal, in which he served as a volunteer. In 1590 he married the widow of Sir Philip Sidney, a daughter of Walsingham. In 1591 he was sent to support Henry IV. against

Spain, but the expedition effected nothing of importance. About this time Essex was on terms of close friendship with Francis Bacon, who assisted him greatly by advice on political and other matters. In 1596 he commanded an expedition to Spain, and greatly distinguished himself at the capture of Cadix. In 1597, after an unsuccessful expedition to the Azores, he, with Howard and Raleigh, made extensive captures of Spanish ships. On his return from this expedition, though at first ill-received by the queen, he was made hereditary earl-marshal. Next year he quarrelled with the queen, who struck him on the ear and bade him 'go and be hanged'. After some months a reconciliation took place, and he was appointed Lord-lieutenant of Ireland (1599), which was then in a state of rebellion. He returned to England in September, having been entirely unsuccessful in his government. He was made a prisoner in his own house, and was shortly afterwards (June, 1600) tried by a special court. The charges against him were that he had exceeded his instructions in the Irish campaign, and had deserted his post without leave; and he was deprived of all his offices, and sentenced to imprisonment during the queen's pleasure. Not long afterwards he was set at liberty. He now conceived a deep resentment against the queen's councillors, particularly Cecil and Raleigh, who, he imagined, had biased her against him. He threw open his house to the disaffected of all parties, and courted both the Puritans and the Roman Catholics. Being summoned before the council, he assembled his friends in his house, arrested the messengers sent to him by the queen, and, proceeding to the city, endeavoured to enlist the citizens in his favour. After a skirmish with a party of soldiers he returned to his house, but after a short defence he was compelled to surrender, and sent to the Tower. He was tried for treason on 19th February, and executed on the 26th February, 1601. Essex was possessed of some good qualities, according to his panegyrists; but they seem to have been but weak ones, as the vanity and presumption excited by the queen's partiality sufficed completely to overbear them. See Spedding's Bacon, and Abbott's Bacon and Essex.

ESSLINGEN, a town of Germany, in Württemberg, beautifully situated on the Neckar, here crossed by a bridge, 7 miles S.E. of Stuttgart. It was founded in the eighth century, was long an imperial free town, is surrounded by walls flanked with towers, and defended by a castle, and has two old churches, one of them an ancient but handsome Gothic structure of the thirteenth century, with a tower 230 feet high, an ancient and a modern town-house, an old monastery, &c. There are manufactures of machinery, articles of wood, gold, silver, and tin, cutlery, dye-works, paper, spinning, and other mills. Pop. in 1900, 27,325.

ESSOUAN, or **ASSOUAN** (*Syene*), a town of Upper Egypt, on the east bank of the Nile, near the foot of the first cataract, 110 miles S. of Thebes. Opposite it is the interesting island of Elephantine (which see). It has railway communication with Lower Egypt and with places higher up, and carries on a trade in dates, senna, charcoal, &c. There are granite quarries in the neighbourhood. Early in 1899 the foundation-stone of a gigantic reservoir dam was formally laid here. It is to be constructed of granite quarried in the neighbourhood, and is expected to take five years to complete. It will regulate the supply of water for irrigation, and will be provided with the necessary sluices, and also allow of the passage of vessels up or down. A very large number of workmen—Egyptians, Italians, Maltese, Syrians,

Greeks, Arabs, &c., are employed, and already something like a small town, with hospital, restaurant, shops, church, police-quarters, &c., has arisen in connection with the works. The population of Essouan proper is estimated at 6000.

ESTAFETTE, a courier who carries his message in conjunction with others by relay.

ESTATE, in law, signifies the title or interest which a person has in lands, tenements, hereditaments, or other effects. Estate is real or personal. The phrase *personal estate* is applicable not only to movables, goods, money, bonds, notes, but also to some fixtures temporarily attached to lands or buildings; and the distinction between those fixtures which are temporarily such, and those which belong to, and form a part of, the house or other real estate, is of great importance. Personal estate also applies to some interests in lands or houses, as a lease of them for a certain number of years, however many; and yet an estate for life, though the person by whose life the interest is limited may be ever so old or infirm, and likely to survive ever so short a time, is real estate. Real estate in lands is of various kinds and descriptions, according to the quantity of interest, its duration, or the time by which it is limited in respect to its commencement or termination, and the number and condition of the owners. A *fee simple* is the amplest estate which the law admits of. (See **FEU**.) A *freehold* is an estate for the life of any person or persons in lands or tenements. An estate *in tail* is one limited to certain heirs. (See **ENTAIL**.) An estate *in remainder* is one of which the owner is to come into possession after the expiration of an intermediate estate of another person, or number of persons or heirs: and so also is an estate in reversion: thus, if one grants an estate tail, this estate tail may expire, in which case the lands will come back or revert to the grantor, and his estate, which still remains to him after he has granted the estate tail, is therefore called a *reversion*. As to the number of owners, an estate *in common* is a freehold belonging to more than one proprietor, in undivided shares; and so also is an estate *in joint-tenancy*; but when one joint-tenant dies, his share goes to the other joint-tenants, which is not the case in tenancies in common. An estate *in coparcenary* arises when an estate in fee simple descends, on the decease of the owner, to his daughters, sisters, aunts, or female cousins, or their representatives, being females, and they are called *coparceners*, or, for brevity, *parceners*. Real estate left to any one by will is called a *devise*, or an estate *by devise*, in distinction from a bequest of personal property, which is called a *legacy*.

ESTATES OF THE REALM, in Britain, are the lords spiritual, the lords temporal, and the commons. From the circumstance that the lords spiritual and temporal meet in one house, and practically form one branch of the legislature, the popular error has arisen that the sovereign forms one of the three estates of the realm.

ESTE, a town of Italy, in the province of Padua, beautifully situated on the south side of the Euganean Hills, 16 miles S.W. of Padua. It is an ancient place, with an unaltered Lombard aspect; and has a ruinous castle, the cradle of the Este family (see next article), a Romanesque duomo, a leaning tower, &c. Pop. 6000.

ESTE, one of the most ancient and illustrious families of Italy. We mention first **ALBERT Azzo II.**, who is considered the founder of the greatness of his house. He inherited or acquired Este, Rovigo, Montagnana, Casal Maggiore, and other places in Italy; and was made governor of Milan by Henry III. in 1045. He married, first, Cunegonda, sister of Welf (or Guelf)

III. of Carinthia, and afterwards, as his second wife, Garisenda, countess of Maine, of which county he took possession, and gave it to his son Ugo, who soon after lost it. Another of his sons became Duke of Bavaria in 1071, by the title of Welf I. He was the ancestor of the German branch of the house of Este, the Dukes of Brunswick and Hanover. (See BRUNSWICK, FAMILY OF.) Albert Azzo died at an advanced age in 1097, having previously resigned his Italian possessions to his son Fulk, and retired to Burgundy.

—FULK I. was attacked by his brother Welf, who compelled him to become tributary to him to the extent of a third of his revenues. He was succeeded in 1137 by his son, OBIZZO I., who joined the Lombard league against Frederick Barbarossa in 1187. He was chosen podestà of Padua in 1182, and made Marquis of Milan and Genoa, a dignity which was equivalent to a vicariate of the emperor, in 1184. He died in 1193, and was succeeded by his son, who in the annals of the family is called Azzo V. Either he or Oberto acquired by marriage Ferrara, with its dependencies in Romagna, and with a feud which became hereditary with the house of Torello, for a member of which house the bride, violently carried away by the Estes, was intended. The house of Este thus became vassals of the church as well as of the empire. He was succeeded by Azzo VI., who died in 1212. He was constantly engaged in war with the Torelli, by whom he was thrice driven from Ferrara.

ALDOBRANDINO, his son, died young, and was succeeded by his brother Azzo VII., a minor, in 1215. He was engaged in protracted wars with the Ghibelline party, particularly with the houses Torello and Romano, in which he was finally victorious. Honorius VII. invested him with the marquisate of Ancona. He died in 1264, and was succeeded by his grandson, OBIZZO II., who was chosen Lord of Modena and Reggio. We may pass over his successors on to NICCOLO III., who succeeded in 1393 at the age of nine. During his reign, and those of some of his predecessors, the house of Este became patrons of literature. He caused his second wife, Parisina Malatesta, and his natural son to be executed for an unnatural intercourse, together with two ladies of the court who were their accomplices. This is the subject of Byron's poem *Parisina*. He died at Milan, 26th December, 1441. —LIONEL, his son (1441–50), receives a high character from Muratori for justice and piety, and for his patronage of letters. He mediated a peace in 1450 between the Venetians and Alfonso, king of Sicily; and died in November of the same year. He was succeeded by his brother, BORSO, who died 20th August, 1471, who received new accessions of dignity from the emperor, and was created Duke of Ferrara by Pope Paul II. in April, 1471. His reign was peaceable and prosperous. He established printing in his estates. —ERCOLE I., his brother (died 25th January, 1505), succeeded, to the prejudice of his son Niccolo. His usurpation caused a war, which was unsuccessful in deposing him. He had Milan and Florence for allies, the pope and Venice for adversaries. After the conclusion of peace in 1484 he maintained neutrality in his estates for the remainder of his reign, while the rest of Italy was convulsed with wars and revolutions. He had for his minister Boiardo, the famous author of the *Orlando Innamorato*; and Ariosto, born near the commencement of his reign, grew up under his patronage. —ALFONSO I., his son, died 31st October, 1534. His reign was a contrast to the peaceable one of his father. In 1509 he joined the league of Cambray, and commanded the Papal army as gonfalonier. While he was conducting the operations of the allies elsewhere, his estates were ravaged by the mercenary troops of Venice, whose

atrocities are described in the thirty-sixth canto of the *Orlando Furioso*. Alfonso continued in the French alliance after the pope had joined the Venetians. He assisted in the battle of Ravenna, and took prisoner Fabrizio Colonna, the general of the pope. (See COLONNA.) After the French had been driven from Italy he endeavoured to make peace with the pope; but Julius continued implacable. Leo X. restored him to his possessions, with the exception of Modena and Reggio, but afterwards excommunicated him. He joined in the wars between Francis I. and Charles V. on the side of the French king, but was afterwards reconciled with the emperor, who confirmed him in his possessions, against Pope Clement VII. (1530). He married as his second wife the famous Lucrezia Borgia, of whom he had the honour to be the fourth husband. His brother, the Cardinal Ippolito, was the patron of Ariosto. Alfonso was succeeded by his son by Lucrezia, ERCOLE II., who died 3d October, 1559. He married Renée of France (daughter of Louis XII.) in 1528. She favoured the Reformation, and made the court of Ferrara the resort of the few advocates of that cause in Italy. Calvin visited it in 1535. Ercole at first adhered to the imperial party, but in 1556 he joined the league of Paul IV. and Henry II. of France against Spain, and was made general of the allied forces; but he did not push the war with vigour, and made peace with Spain in 1558. Leonora, his daughter by Renée, was the object of the unfortunate attachment of Tasso. He was succeeded by his son, ALFONSO II., the patron and persecutor of Tasso, who died 27th October, 1597. Tasso was imprisoned by him in a madhouse for seven years (1579–86), for daring to set his eyes on the Princess Lucrezia, and was liberated at length at the intercession of the pope and the emperor. Although three times married, Alfonso left no heir. He was succeeded by his cousin CESARE (died 11th December, 1628), whom by his testament he had made his heir; but this disposition was annulled by the pope, Clement VIII., who excommunicated Cesare and deprived him of Ferrara, with the dependencies of the Church. Cesare was obliged to content himself with Modena and Reggio, which depended on the empire. From this period the political importance of the house of Este greatly diminishes, and we need not enumerate all the different princes. The last sovereign of the house was FRANCESCO V., who succeeded in 1846. He withdrew 23d March, 1848, in consequence of one of the numerous insurrections stimulated by the French revolution of February. He was re-established, but fresh disturbances broke out in 1859, the dynasty was deposed by the National Assembly, the duchy was annexed to Sardinia by the Treaty of Zurich, 10th November, 1859, and has consequently been incorporated with the Kingdom of Italy.

ESTELLA (ancient *Alba*), a town, Spain, Navarre, on the left bank of the Ega, here crossed by two fine bridges, 24 miles south-west of Pampeluna. It consists of several squares, and clean well-paved streets, and has six churches, one of them a magnificent structure with a lofty tower; an ancient castle, a town-house, college, and an hospital; manufactures of woollen and linen goods, leather, and earthenware, several distilleries and oil-mills, some trade, and an annual fair. Don Carlos, who long made it his headquarters, was proclaimed king at Estella in 1833. Pop. (1837), 5968; (1897), 5284.

ESTEPA (ancient *Astapa*), a town, Spain, Andalusia, on the north side of Mount San Francisco, 50 miles east by south of Seville. It consists chiefly of three main streets and four squares, and has two churches, one of them a handsome structure, formerly used as a mosque; a college, several suppressed convents, two hospitals, and the remains of an old castle,

once deemed impregnable. The manufactures consist of coarse cloth and balse; the trade is in grain, fruit, brandy, oil, wool, and cattle, and both building stone and marble are quarried in the vicinity. Pop. (1897), 8768.

ESTEPONA, a seaport, Spain, Andalusia, on the Mediterranean, 23 miles north-east of Gibraltar. It consists of seven small squares, and wide, well-paved, and regularly-built streets; and has a large and handsome parish church, with a tower; a college, a custom-house, and an ancient castle; manufactures of woollen stuffs, leather, and pottery, and a limited trade in grain, cattle, fruit, and lead—the last obtained from mines in the vicinity. Pop. (1897), 8307.

ESTERHAZ, a village, Hungary, county and 14 miles S.E. of Oedenburg, on the south shore of Lake Neusiedel. It contains the original seat of the Esterhazy family, a huge structure in the most florid Italian style, with a large park containing a theatre in which many of Haydn's compositions were first performed, he being capellmeister here in 1760-90.

ESTERHAZY VON GALANTHA, a family of Hungarian magnates, afterwards princes of the German Empire, whose authentic genealogy goes back to the first half of the 13th century. They were zealous partisans of the house of Hapsburg, to whom, during the reigns of Frederick II. and Leopold I., they lent a powerful support. In 1238 Peter and Elias, sons of Salomon von Estoras, divided their father's inheritance. The former obtained Zerhaz, the latter Ilyehaza, and thus became the founders of two principal lines, the latter of which became extinct in the male line in 1838, with Count Stephen Illeahazy. Peter's descendants took from their domain the name of Zerhazy, till Francis Zerhazy, who was born in 1568, and died in 1595, and was vice-regent of the county of Presburg, changed this name into Esterhazy in 1584, on the occasion of his being named Lord of Galantha. Francis left four sons—Gabriel, Daniel, Paul III., and Nikolaus II. Gabriel's male descendants became extinct with his son Wolfgang in 1670, whereas the other three founded separate houses—at Czeesnek, in the county of Veszprim; at Altschl, in that of Suhl; and at Frakno or Forchtenstein, in that of Oedenburg. The two first lines obtained the title of count in 1683; the last was raised to the title of Margrave of Forchtenstein in 1626, in the person of its founder, Nikolaus II., who was one of the most distinguished members of the family; and at his death, in 1645, was palatine and field-marshal.

ESTHER, a Jewess, whose story is told in the book of Esther. Ahasuerus, king of Persia, had dismissed his queen Vashti for disobedience. By the advice of his ministers he collected together a number of virgins as concubines, with a view to selecting one of them as the successor of Vashti. Esther was among these. She was an orphan brought up by her cousin Mordecai, who charged her to conceal her race. Her beauty enchanted Ahasuerus, and she was chosen queen. After this Ahasuerus promoted Haman, the son of Hammedatha, an Agagite, to the highest honour in the state. Mordecai, who seems to have held a subordinate position about the palace, refused to give this man the customary honours of his rank, apparently because he was of a race held accursed by the Jews. Haman's wrath at Mordecai's contempt led him to plan the destruction of all the Jews, and he obtained the consent of Ahasuerus to a general massacre of them throughout the empire on the 13th day of the 12th month—a day appointed by lot. Esther, at the command of Mordecai, now appeared before the king uncalled, and at the risk of her life, to reveal her origin and ask the life of her people. The king, incensed against Haman now that he had

discovered the queen to be a Jewess, commanded him to be hanged on a gallows he had prepared for Mordecai. But the decree granted to Haman could not be reversed, it being contrary to the law of the Persians to reverse any decree sealed with the king's seal. The seal was therefore committed to Mordecai, who was advanced to Haman's place, and who, together with Esther, wrote fresh instructions to all the provinces of the empire, permitting the Jews to stand up in their own defence. The fear of Mordecai caused the local governors to assist the Jews, and instead of the massacre of the Jews, it was a slaughter of their enemies that took place. The Jews celebrate this event on the 14th and 15th days of the month Adar, called the days of Purim, or the lot. Various opinions are held as to which king of Persia is to be understood by Ahasuerus. Darius and Xerxes are most commonly named. But many authorities regard the story of Esther as a fictitious narrative.

ESTHETICS. See **ÆSTHETICS**.

ESTHONIA, **ESTHLAND**, or **REVEL**, a maritime government of Russia, bounded N. by the Gulf of Finland, E. by St. Petersburg, S.E. by Lake Peipus, S. by Livonia, and W. by the Baltic. Besides the mainland thus bounded, it includes several islands, of which the most important are Dagoe and Oesel; area, about 7610 square miles. It is of an irregularly oval shape, having its greater axis east to west, and has for the most part a flat or undulating surface. A few low heights occasionally appear, but scarcely deserve the name of hills. The whole of the north side, however, rises considerably above the sea, and presents to it ranges of cliffs, on which the waves often break with considerable violence. The air is somewhat moist, but the sky, notwithstanding, is generally clear, and the climate healthy. Winter lasts long, and wind, with more or less violence, is almost incessant throughout the year. The Narva, which merely bounds the government on the east, is the only river of any importance; but minor streams, as well as small lakes, are very numerous. The soil is by no means fertile. A great part of it, particularly in the north, is sandy, and in other quarters it is often covered with boulders and gravel; but fertile tracts of clayey or chalky loam occur, and the grain raised is said to equal the consumption. The crops include a little wheat, much barley and oats, and some flax, hops, and tobacco. Very little fruit is grown. Wood, however—chiefly pine, birch, and alder—is abundant; and the forests are well supplied with game. Fish abound, both in the lakes and on the coast, and active fisheries are carried on. The minerals are of no importance; and the manufactures, confined to coarse articles of primary necessity, are almost entirely domestic. The only exception is spirits, which are made in numerous distilleries, and partly exported. The only other exports of any importance are hides and salt fish. The chief imports are herrings and salt. The peasantry are almost all of Finnish origin, and speak a Finnish dialect, the vocabulary of which is described as scanty. The land is farmed chiefly by Germans and Danes. The prevailing religion is Lutheran; but education is miserably neglected. For administrative purposes Esthonia is under the Governor-general of Riga, and consists of four districts—Revel being the capital. Pop. (1897), 413,724.

ESTOPPEL, in law, a term for anything which puts a period to an action by closing the ground of controversy. Thus, a person's own deed, when adduced in evidence against him, is adjudged to be conclusive. In general, any previous admission precludes the person who makes it from controverting the thing admitted; thus, a tenant cannot dispute the title of the landlord of whom he holds.

ESTRAYS are any valuable beasts, not wild, found within a lordship, and whose owner is not known, such as are commonly impounded and not claimed. They are then to be proclaimed in the church and two nearest market-towns, on two market days, and not being claimed by the owner, belong to the king, and now commonly, by grant of the crown, to the lord of the manor or the liberty.

ESTRÉES, GABRIELLE D', Duchess of Beaufort, the mistress of Henry IV. of France, was the daughter of Antoine d'Estrées, a descendant of one of the noblest houses in Picardy, and born about 1571. Gabrielle was in her twentieth year of age when Henry first saw her in a visit to Cœuvres Castle; and she shortly after became his mistress. Henry married her to a nobleman named Damerval, of Liancourt; but subsequently dissolved the marriage. Henry intended to raise Gabrielle, whom he had created Duchess of Beaufort, to the throne as his lawful wife. This design was strongly opposed by Sully, and Gabrielle became his bitter enemy. But in 1599, while negotiations were in train for the divorce of the king, Gabrielle, having gone to Paris during Easter, was seized with convulsions after eating an orange, and died suddenly. It was suspected that she had been poisoned. She had three children to Henry, the most celebrated of whom was César, duke of Vendôme.

ESTREMADURA, a west division of Spain, consisting of the provinces of Badajoz and Cáceres. It is bounded n. by Leon and Old Castile; e. by New Castile; s. and s. by Andalusia; w. by Portugal, and is generally surrounded by mountain-barriers. The north and south parts are mountainous; and another lofty range, a continuation of the mountains of Toledo, in New Castile, intersects it in the centre from east to west, and joins the Sierra del Portalegre, on the frontiers of Portugal. The portion of the province north of this range is called Estremadura Alta (Upper), that south of it Estremadura Baja (Lower). Estremadura consists chiefly of extensive plains, capable, from their fertility, of yielding corn, wine, and oil, in the greatest abundance, but which are left neglected and uncultivated, the result of a wretched government. The climate is hot in summer, but not ungenial; nor is the winter severe. The Tagus and Guadiana intersect it east to west, the former passing through Alta, and the latter through Baja Estremadura, and thus dividing it into three nearly equal parts. It is well watered by the numerous affluents of these two important streams. Game of every sort is plentiful, and immense flocks of sheep graze on the rich plains of this neglected country. They are of the Merino breed, the greater part of them being driven down annually from the highlands of the neighbouring and more mountainous provinces, by their owners, without leave asked or obtained, to quarter for the winter season on the warm, fertile lowlands of Estremadura. The minerals, of which there are copper, lead, iron, and silver, are entirely neglected; and there are no manufactures. The roads are miserable, being chiefly made by sheep, and the inns are of the most wretched description. Pop. (1896), 844,796.

ESTREMADURA, a maritime province of Portugal, bounded n. and e. by the province of Beira, s. and s. by Alentejo, and w. by the Atlantic Ocean. It is divided by the Tagus into two nearly equal parts, of which the northern is the more mountainous, and includes the last slopes of the Serra da Estrella, from which the Serra Alvyazere proceeds s.w., culminating in Mount Junco, 2320 feet; forming the heights of Torres Vedras, and ending on the north bank, and near the mouth of the Tagus. West of this ridge the country is mostly flat and sandy, especially towards the coast; and south-east of it, especially in the

northern parts, it is more fertile. Wines (including those of Setubal, Bucellas, and Carcavellos) and olives are the principal produce; but wheat, barley, maize, hemp, legumes, and fruits of all kinds, including chestnuts, oranges, and lemons, are grown; and from the forests sumach and cork are obtained. Cattle-rearing is little attended to, but swine are numerous. Minerals abound, but only salt is wrought. There are some woollen and linen manufactures, and some crystal is made at Leiria. The climate is generally healthy. The principal city is Lisbon, the metropolis of Portugal, in which, and in Setubal, the most of the trade is concentrated. Area, 8834 square miles. Pop. in 1890, 1,091,401; (1900), 1,232,593.

ESTREMOZ, or **EXTREMOZ**, a town of Portugal, in the province of Alentejo, 22 miles west from Elvas. It consists of an upper and a lower town, both indifferently built, and was once a place of great strength, though its fortifications are now falling to decay. It has several churches and convents, manufactures of hardware, potteries, tanneries, marble quarries, and an annual fair, which lasts five days. Pop. 7274.

ESZEK, or **ESSEK**, a royal free town of the Austrian Empire, Slavonia, capital of the county of Virovitica, in a marshy and unhealthy district, on the right bank of the Drave, here crossed by a bridge, 68 miles w.n.w. of Peterwardein. It consists of the town proper, partially fortified, and three suburbs, is the seat of an appeal court for three counties, and has a handsome square, several churches, a town-house, court-house, gymnasium, and normal school, two convents, an hospital, and barracks. The manufactures are trifling; but the four annual fairs, chiefly for corn, cattle, and hides, are important. As a Roman colony, founded by the Emperor Adrian, under the name of Mursia, it became the capital of Lower Pannonia, and in 335 was made a bishop's see by Constantine. Pop. (1900), 22,987.

ÉTAMPES (ancient *Stampæ*), a town of France, in the department of the Seine-et-Oise, in a beautiful valley, at the confluence of the Étampes and Juine, 30 miles s. by w. from Paris, and crossed by the Paris and Orleans Railway. It is a clean, well-built place, with planted boulevards, four Gothic churches, one of them a remarkable structure of the thirteenth century; a town-house of quaint architecture, a communal college, and the remains of an ancient castle, several tanneries and woollen bleacheries, and a considerable trade in corn, flour, and prepared wool. Pop. (1891), 8270.

ÉTAT-MAJOR, a term which has been in use in France from the time of Louis XIV., signifies the whole of the persons directing an army, corps, brigade, or regiment. The *état-major général* of the land forces, by the law of the late French empire, consisted of the marshals and generals of all arms. They were divided into active and reserved; the latter on three-fifths pay, and disposable in case of war. The *état-major* of an army in the field corresponds generally with what is called the staff of the general, consisting of a chief of the staff, aides-de-camp, surgeons, &c.

ÉTAWEH, or **ETAWAH**, a town of Hindustan, in the N. W. Provinces, 70 miles s.e. of Agra, capital of the district of same name, situated among deep ravines, on the left bank of the Jamna, and embosomed among trees. It was once a place of importance, and the residence of many of the Mogul gyan-dees. It has various interesting buildings, a handsome square in the centre, and a civil station about half a mile outside the town. Pop. (1891), 33,793.

ETCHING. See **ENGRAVING**.

ETEOCLES and **POLYNICES**, two heroes of ancient Greek legend, sons of Œdipus, king of Thebes,

and Jocasta. (See *CEIPUS*.) After their father's banishment from Thebes, they agreed to rule the city each a year alternately. Eteocles violated this compact, and Polynices fled, to implore the assistance of Adrastus, king of Argos, who marched against Thebes, with Polynices and six other Grecian princes. The city made an obstinate defence. The two brothers fell by each other's hand; and Creon, their uncle, ascended the throne of Thebes. He prohibited the interment of Polynices, under penalty of death; but Antigone, sister of the deceased, yielding to the voice of nature, resolved to perform this last rite for her deceased brother. She was discovered, and buried alive by the order of Creon. This act of cruelty recoiled on himself; for his son, Hæmon, who was in love with her, killed himself on her grave. Different versions of the story are given by the Greek dramatists. Racine has dramatized this story with some poetical variations in his *Frères Ennemis*.

ETHELBERT, King of Kent, born about 552, succeeded his father Bormenic in 560. He attempted to extend his kingdom by conquest, but a defeat administered at Wimbledon by the West Saxons restricted him to the south-east corner of the country. Ethelbert married Bertha, the daughter of Charibert, king of the Franks, and a Christian princess, who, stipulating for free exercise of her religion, brought over with her a Frankish bishop. Her conduct was so exemplary as to prepossess the king and his court in favour of the Christian religion. In consequence, Pope Gregory the Great sent a mission of forty monks, headed by Augustine, to preach the gospel to the Saxons (597). They were well received, and numbers were converted; and the king himself at length submitted to be baptized. Civilization and knowledge followed Christianity, and Ethelbert, about 600, enacted a body of laws, which was the first written code promulgated by the northern conquerors. At the time of the landing of Augustine, he had acquired a supremacy over all the English south of the Humber. Ethelbert founded the see of Rochester in 604, and afterwards that of London. He died in 616, and was succeeded by his son, Eadbald.

ETHELBERT, King of Southern England, third son of Ethelwulf, succeeded to the government of Kent about 855; and in 860, on the death of his brother Ethelbald, became king of Wessex. His reign was much disturbed by the inroads of the Danes, whom he repulsed with vigour, but without permanent success, as, whenever they were driven from one part of the country, they ravaged another. He died in 866.

ETHELRED I, King of England, fourth son of Ethelwulf, succeeded his brother Ethelbert in 866. The Danes became so formidable in his reign as to threaten the conquest of the whole country. Assisted by his brother Alfred, Ethelred drove them from the centre of Mercia, where they had penetrated; but, the Mercians refusing to act with him, he was obliged to trust to the West Saxons alone, his hereditary subjects. Notwithstanding various successes, especially a great victory at Ashdown, the invaders continually increased in numbers. Ethelred died, in consequence of a wound received in an action with them, in 871, and was succeeded by Alfred.

ETHELRED II, King of England, son of Edgar, born 968, succeeded his brother, Edward the Martyr, in 978, and, for his want of sound judgment and sagacity, was surnamed the *Unready* (without *rede* or counsel). About 981 the Danes, who had for some time ceased their inroads, renewed them with great fury. In his reign began the

practice of buying them off by presents of money. After repeated payments of tribute (see *DANEGELT*) he effected, in 1002, a general massacre of the Danes in England. Such revenge only rendered his enemies more violent; and in 1008 Sweyn and his Danes carried fire and sword through the country. They were again bribed to depart; but, upon a new invasion, Sweyn obliged the nobles to swear allegiance to him as King of England; while Ethelred, in 1013, fled to Normandy with his family. On the death of Sweyn, in 1013, he was invited by the national council to resume the government. He died at London in 1016. Ethelred, in 1002, married, as his second wife, Emma, sister of the Norman Duke Richard II.

ETHELWULF, King of England, succeeded his father, Egbert, in 838, and soon after his accession associated his son Athelstan with him, giving him the sovereignty over Essex, Kent, and Sussex. In 851 the Danes poured into the country in such numbers that they threatened to subdue it; and though opposed with great vigour by Athelstan and others, they fixed their winter quarters in England, and next year burned Canterbury and London. After inflicting a great defeat on the Danes at Ockley, he went on a pilgrimage to Rome, and before returning, married Judith, daughter of Charles the Bald. On his return he found his son Ethelbald in revolt against him, and in order to avoid a civil war, he gave up the western division of the kingdom to his son, retaining Kent for himself. Before going to Rome, Ethelwulf had made certain grants, which used to be regarded as the first payment of tithes in England; but modern authorities reject this view. He died in 858.

ETHER, in physics. See *INTERSTELLAR ETHER*.

ETHERS. The term ether was first applied to the volatile fluid obtained by the action of sulphuric acid on spirit of wine. (See *SULPHURIC ETHER*.) The reaction by which ether is got from alcohol, and the part which the sulphuric acid performs, were for a long time the subjects of minute experiment and ardent discussion among the most eminent chemists. The theory which was ultimately, and is now universally, accepted explains what takes place by showing that the alcohol and acid react with each other, in such a manner that sulphethylic acid is formed. When this compound reacts with another portion of alcohol, ether distils over, and the sulphuric acid is reproduced ready to go through the same operation. Hence a limited quantity of acid can convert a large amount of alcohol into ether. Further investigation has shown that other alcohols are capable of acting like ordinary spirit, and that other acids so far resemble sulphuric acid that they can form compounds analogous to sulphethylic acid. To all these bodies the term ether has been extended, so that it includes a very large and ever-increasing collection of compounds. Like other terms, however, it has been used somewhat arbitrarily, according to the general hypothesis current at a particular epoch in the history of the science.

Ethers are classified as simple, mixed, and compound. The simple ethers are the oxides of the alcohol radicles, and of these the type is common ether. Mixed ethers are also oxides, but contain two or more different alcohol radicles. The compound ethers contain both an alcoholic and an acid radicle, and the latter may be either inorganic or organic. Thus, sulphethylic acid above mentioned is the acid sulphate of ethyl; nitric ether is the nitrate of ethyl, hydrochloric ether the chloride of ethyl; acetic ether is the acetate of ethyl; oil of wintergreen yields salicylate of methyl, and ordinary suet is an ether containing tristearate of glycerin. The properties of

the others therefore vary greatly; some are volatile fluids, others are solids with high fusion points. They are more or less odorous, rapid, and inflammable. Some mix with water and dissolve in alcohol. The solid ethers dissolve in the volatile fluid ethers. Hence the use of common ether as a solvent for the oils and fats.

ETHEREGE, SIR GEORGE, one of the wits of Charles II.'s day, chiefly known as a writer of comedy, was born about 1636. He is supposed to have been for some time at Cambridge, then to have travelled, and on his return to have been entered at one of the inns of court. In 1664 he presented to the town his first comedy, entitled the Comical Revenge, or Love in a Tub; an incongruous mixture of prose and verse, but suited to the taste of the times, and which was well received. The author was immediately enrolled among the courtly wits of the day, and in 1668 brought out his next piece, entitled She Would if She Could, which was very coarse and licentious. In 1676 he produced his third and last comedy, entitled The Man of the Mode, or Sir Fopling Flutter; at which time he was, as the dedication implies, in the service of Mary of Modena, the second duchess of York. This performance was still more applauded than the preceding, and the Sir Fopling was, for a long time, deemed the ideal of the superlative beau or coxcomb of the age. Etherage's plays are little more than lively conversation pieces, with a great paucity of genuine humour or felicitous plot, and have long been placed on the manager's shelf. On the accession of James II. he was knighted and appointed envoy to Ratisbon, whence he wrote two letters to the Duke of Buckingham, which are printed in the Biographia Britannica. On the Revolution he is said to have joined his former master in France. He is supposed to have died about 1688.

ETHICS (from Greek *ēthikos*, relating to morals, from *ēthos*, moral temper) is the science which treats of the nature and laws of the actions of intelligent beings, considered in relation to the qualities of good or evil, or as it may be otherwise expressed, of the moral qualities of these actions. It is a speculative science, and like other speculative sciences is liable to a great variety of treatment. Although there is no fundamental distinction between ancient and modern systems of ethics considered purely as speculative systems, yet as speculation is always materially affected by external surroundings, and as the introduction of Christianity and the refinement of modern methods of investigation have in various ways affected the development of this science, it has been found convenient to divide the various systems of ethics into ancient and modern.

The foundations of the leading systems were laid in antiquity. Socrates taught that for the proper guidance of his conduct self-knowledge was indispensable to man. But to have a true knowledge of himself he must know the Author of his being. The knowledge of God accordingly is the source of morality. This knowledge is to be derived from his works, which show him to be wise and good. The nature of man resembles that of God, and its proper pursuit is virtue, which consists in doing what the study of his own nature and of the laws of the Creator, discoverable in the system of the universe, reveals to be right. Happiness is inseparable from virtue. Plato, the faithful disciple of Socrates, amplified and systematized the views he received from his master. He defined the Divine Nature as a union of the good, the beautiful, and the true, which are in themselves eternal, necessary, and immutable. He also analyzed human nature, and assigned to it its specific virtues, and in his Republic he made the application of ethics to politics. Aristotle was also a follower of Socrates,

but in many respects he took up an independent position. In ethics he diverged on a vital point from the doctrines of Socrates and Plato. Like them, he taught that man was free and rational, but he made happiness the end of virtue. He banishes God in great measure from the world, of which he is too high and pure to take cognizance, and he makes utility the governing principle of society. He places virtue in moderation, and makes each particular virtue a mean between two extremes. Epicurus placed his system yet more broadly on a utilitarian basis. Pleasure is to be sought and pain avoided for their own sake. By an analysis of the various pleasures and pains of which human nature is susceptible, and the cost at which they are procured, Epicurus arrives at the conclusion that the chief good (maximum of pleasure) is repose of mind, together with the tranquil enjoyments which do not disturb it. The Stoics placed the supreme good in conformity to nature, that is, to the immutable laws which reason discovers in the universe. They held that only to be good which is so eternally, and believing in an infinite concatenation of causes and effects tended strongly to fatalism. They made virtue nearly synonymous with intelligence and vice with error. The active virtue of Stoicism took the form of a conflict with passion, as being contrary to reason, its passive virtue took the form of indifference to pleasure and pain as things in themselves indifferent to reason. The founder of this school, one of the most famous in antiquity, was Zeno.

In our biographies of various philosophers, ancient and modern, and in our notices of the leading schools, further details of this kind will be found, and as it would serve little purpose to give the conclusions of the different schools without an analysis of their principles, we purpose in this article to present a brief classification of modern systems, with a view to establish, if possible, as far as a mere outline will serve, some criteria by which to estimate their merits.

It is obvious that ethics or moral philosophy must be based on metaphysics or philosophy properly so called. According to the view which the individual thinker may take of the powers and relations of the mind itself will be his view of the duties and responsibilities which these powers and relations involve. We shall for the present assume only a single principle, that any system of ethics to be true must satisfactorily explain the moral facts of our nature, that is to say the beliefs in regard to morality currently acted on by mankind.

At the very outset a question arises as to the nature of the acts of intelligent beings, which is properly psychological, and which divides all possible systems of ethics into two classes according as it is answered in the affirmative or in the negative. Are the acts of such intelligent beings as we are free or are they not? If this question is answered in the negative ethics becomes merely a descriptive science. We may class certain actions as good or bad, and lay down laws as to the order of their occurrence, but we cannot make these laws available for the guidance of the actors; for the power to make the investigation of them affect any practical result would prove a certain amount of liberty. Before answering this question it is of importance that it should be rightly stated, for the negative answer is so repugnant to our natural ideas that it is much more common to reach it by a false definition of liberty than by a direct negation of it. It is not an assertion but a denial of the liberty of the will to say that it consists in the implicit consent of the will to all so-called voluntary actions. The only question at issue is the passivity or activity of the intellect

in the determinations of the will. They who deny the freedom of the will are they who assert that the actions of men are inevitably determined by antecedents, that the intellect of man is merely a repeating source of action, of which the activity, like that of winds and other natural agents, is no more in amount or duration than is imposed by the forces originating and sustaining it. They who maintain the freedom of the will are they only who hold that man's activity has its source in himself, its occasion only in external objects. Another distinction between these opposing theories which is apt to lead to misunderstanding is this: If a man's actions are necessarily determined by antecedents he is free from obligation and responsibility, consequently from the constraint of law; if he has an inherent power of action that power is subject to law and therefore to restraint, so that liberty is coincident with subjection to restraint and bondage with freedom from it. They who maintain the former theory reason thus: A man's actions are determined by his feelings, his feelings by the objects which solicit them. These objects must be contained in his consciousness, so that to know his feelings we have only to know the condition of his physical nature together with the objects contained in his consciousness, and these together constitute the determining causes of his actions. It is plain that this reasoning affirms the passivity of the reason or understanding itself, and they who maintain this position have a formidable obstacle to encounter in the universal belief of mankind, including their own sect, as to the natural source of human actions. In every communication we make to one another, in the forms of every language, in the laws of every nation, we affirm the origination of human intelligence. When we say, 'I might have done,' 'I ought to have done,' 'He did wrong,' 'He acted shamefully,' 'It was nobly done,' when we speak with enthusiasm, with indignation, with irony of the deeds which history records of human actors, we mean, if we speak rationally at all, that all the circumstances being supposed, the actors might have done differently. When there is a railway collision, is anybody ever indignant at the engine, and is nobody ever indignant at the driver, the pointman, or the directors? It is then clearly the common testimony of human consciousness that there is a liberty of spontaneous action in the human will. If we examine our consciousness further we shall find that so far from our actions being absolutely controlled by antecedents, or by the objects which solicit our passions, there is frequently not in our minds any object strong enough to prompt us to any action at all; so that rejecting present objects as motives of action we make spontaneous efforts to seek a new one. There is such a phenomenon as a mind judging itself too ill-informed to act aright, and dismissing all present objects as a sufficient ground of action, to turn its activity to the search of new and better objects.

The human mind presents at least three elementary powers or capacities: the power of knowing, the power of feeling, and the power of acting. But these elements, though distinguishable, are not separable. When we distinguish knowledge, feeling, and action, what we call by these names will all be found, when accurately examined, to be combinations of the three elements differing only in respect to the element which preponderates. Thus 'I know' does not mean merely, as Locke would have us suppose, that an object is tumbled into my consciousness as into a receptacle. No conceivable sort of bag would produce the phenomenon of knowledge. To produce this phenomenon requires the forthputting of an active power; this power we call intelligence. The

knowledge of an object always produces some emotion of the mind in regard to it. The normal emotion produced by knowledge is pleasure. The pleasure which knowledge gives may be great or small according to the kind or degree of knowledge, but pleasure of a durable kind is naturally associated with the possession of knowledge in every intelligence. On the other hand, the acquisition is beset with difficulties, obstructions, and limitations, and these are the cause of dissatisfaction and pain, which are often so great that the mind is fain to banish them together with the whole object which excites them from its consciousness; knowledge and the emotions to which it gives rise induce those actions which, in the view of the fatalist, are their results alone, in ours the results of the inherent activity of the mind stimulated by them. Thus we find that it is not in these resultant actions alone that the mind is active. In knowledge it judges, in feeling it affects, in action it determines. To this double proof of the activity of the mind, afforded by the spontaneous testimony of consciousness, and by the observation and analysis of its operations, what can fatalism oppose but a false syllogism in which a variable premise is made to do duty for an invariable? Because the mind is included among the objects of consciousness the fatalist imagines that his enumeration of the antecedents of action is exhaustive, but it is not the mind as an object of consciousness, but intelligence as an active power that we ask him to include in it.

Having established the position that ethics is a practical and not merely a speculative science, the thing which it becomes of most importance to determine is, What is its practical conclusion? And the first answer which we have to give to this question again divides the remaining systems into two classes. The answer which may be said to distinguish the popular and prevailing systems of the present day is what is called the utilitarian one. It may be defined generally by saying that the practical end of ethics—the chief good—is the greatest possible satisfaction of the tendencies of our nature. But although this answer distinguishes the popular philosophies of the day, it must not be received without examination. Like the theory we have just examined, it has to encounter a formidable opposition from the concurrent testimony of human experience.

Before proceeding to examine this testimony we must first fix and identify utilitarianism, for nothing is more common in abstract discussions than by an unconscious duplicity in the use of words to make them mean one thing in the exposition of a system, and another in its defence. If by the satisfaction of the tendencies of our nature we are to understand merely that there is some good towards which our nature tends, which is the end of ethics, the statement is unexceptionable; but the problem of ethics is unsolved, and we must go on to solve it by inquiring, What is this good? If, however, we are to receive this statement as a step towards the solution of the problem, as they who make it undoubtedly intend we should, it necessarily implies that the satisfaction of the tendencies of our nature, without discrimination, is a good in itself, and that all that is needed to make the solution perfect is to ascertain the amount of good contained in each, and how much of this good may be actually realized. The problem of ethics is thus reduced to one of moral arithmetic. This is the accepted position of all consistent utilitarians—of Epicurus, Hobbes, Helvetius, and Bentham.

Taking this view of utilitarianism, it may be observed here that it is chargeable either with imperfect or premature generalization. If it is known that the satisfaction of all the tendencies of our nature is a

good in itself, and therefore proper to be pursued, it must be known whether this satisfaction leads. If this is known, why not state it, and give a definite instead of an indefinite aim to morality? If it is not known whether it leads, how can it be known that it is proper to be pursued?

But a more formidable charge against utilitarianism is, that in assuming the tendencies of human nature to be as such proper objects of pursuit, it does so contrary to fact and human experience. We have hitherto spoken of man only as an intelligent being, and it is to be observed that the science of ethics has to do with man only in virtue of his intelligence. There are no ethics for irrational animals. But man has a double nature. Without going into any question as to the origin of the intellectual part of his nature, it is clear that there are in the two parts of his nature, animal and intellectual, tendencies which do not coincide. In addition, therefore, to any diversity which may exist in our intellectual tendencies themselves, there is a diversity between these and our animal propensities. It is further to be observed, that though we can clearly distinguish the difference between these two natures and the non-identity of their tendencies, we cannot by a mere act of judgment separate entirely between them, so as to say in each particular case, 'This is intellectual, and that is animal. Our actual tendencies, therefore, are mixed tendencies, partly animal and partly intellectual. On this account all practical moralists not wedded to a system recognize a struggle in our nature between opposite tendencies, some of which they call good and others evil, and they make morality consist in pursuing the one and avoiding the other. Two other facts are to be observed in the conclusions of practical moralists, that while moral excellence is attributed exclusively to intellectual tendencies it is not attributed to the whole of these. No moralist not a professed utilitarian ever thought of attributing any moral excellence to the gratification of any of our animal propensities. On the other hand, intellectual passions or emotions, such as anger, revenge, &c., are frequently held to be immoral. From this the reasonable conclusion seems to be, that while the gratification of our animal propensities is a thing in itself indifferent to morals, it is the occasion of exciting intellectual passions contrary to morals, and that therefore such passions exist. If this be so, all the intellectual tendencies of our nature are not all good in themselves.

In pursuance of the objection that utilitarianism rejects the facts supplied by human experience as a foundation for morality, we may further advert to the range of motives acknowledged by it; and it is here that one of the chief vices of the system appears. The charge to be brought against utilitarianism here is, that it reverses the relations of cause and effect, and in cutting off from morality one half of the motives which influence it, cuts off at the same time half of the actions which distinguish it.

When a series of connected events is found uniformly to succeed each other in a certain order, we naturally say that that which comes first is the cause, and that those which follow are the effects. Utilitarianism tells us that certain actions are good, and certain others evil only, because the former are followed by good and the latter by bad results. The natural order of sequence teaches us to say that the results are good if the action is good, and evil if the action is evil. According to the natural order the quality of an action may be distinguished in two ways. We may observe its results, and conclude its quality from them as from the effects to the cause, as we judge of a tree by its fruit; or we may observe the action itself in its origin and history, and accord-

ing to the quality it here exhibits we may judge of its results. Utilitarianism recognizes only the former of these methods, and denies the latter, upon which the former depends.

Again, if happiness is the end of virtue, the motives of our actions must all regard the future. No individual and no society was ever asked to provide for its past happiness. A single true moral motive which has its source in the past thus ruins the whole scheme of utilitarianism. Now how are we to regard such a virtue as gratitude? Will it suffice to say that we ought to be grateful because otherwise men would cease to perform benevolent actions, or that we must be grateful because to be so satisfies a tendency of our nature? On the contrary, does not sound practical morality teach us that men ought to do good irrespective of the gratitude of the recipients, and that they who receive good ought to be grateful irrespective of future advantage? To say that gratitude is a tendency of our nature only means that I will be grateful if it pleases me to be so. This is not what the practical moralist says. He says that our nature tends both to gratitude and ingratitude, and that we ought to practise the one and avoid the other.

Another objection to utilitarianism which we shall not insist upon here, as it has been often and ably enforced (see in particular Jouffroy's *Cour de Droit Naturel—Système de Bentham*), is that it is destitute of the element of obligation, which forms an essential distinction of the morality actually believed and practised by the bulk of mankind, as exemplified in the expressions, 'I ought,' 'I must,' and that wanting this element it is necessarily sterile in its practical application; so that the end which it proposes cannot be transferred by generalization from the individual to society, and that utilitarians are guilty of a logical inconsequence in so extending it.

When I am told to seek the satisfaction of the tendencies of my nature I recognize something which may be highly desirable and expedient, but I do not recognize anything obligatory. Moreover, the obligation to seek the greatest satisfaction of my individual tendencies is not consistent with the obligation to seek the same, or any other good, for society. Society lives by the repression of individual tendencies, and it often requires sacrifices from individuals which it cannot repay. Utilitarianism then must choose its end: if it places this in the satisfaction of the individual it cannot transfer it to society; if in the highest good of society what utilitarian motive compels the individual to promote it? Friendship, patriotism, and philanthropy, all the disinterested and impersonal virtues, are inconsistent with utilitarianism. The mere entertainment of an interested motive destroys them.

But though utilitarianism does not admit of a logical it does to some extent admit of a practical generalization of its end. There are practical utilitarians, and there is a standard of virtue created by their practice, and which is its natural result. Flagrant immorality is adverse to a man's success in life, but a more strict morality than is required by the society in which he moves is also adverse to it. In every society there is what may be called a mercantile standard of morality, to go below which is not safe, to go above it is not profitable. This is the standard of utilitarianism, because it is the point at which individual interest coincides with the interest of society. Talking society as it exists this standard would hardly satisfy an exacting moralist; but we can hardly realize from society as it is what on a thorough application of the utilitarian principle it might become. As long as there are people who believe that virtue ought not to be practised from

interested motives the standard is raised artificially, and utilitarianism, having no fixed social standard of its own, is compelled to comply with it.

Another theory of ethics places the moral principle in the sentimental part of our nature. We must pass over the interesting speculations of Adam Smith and Sir James MacIntosh. More amiable than the theory of utilitarianism this hypothesis is not more sound, and the same criticism suffices to expose its invalidity. In placing morality in instinct it fails to recognize in it the essential elements of law and obligation by which the morality that operates in human experience is distinguished.

The remaining systems are those which recognize that the ideas of law and obligation can have their source only in reason. There are still great differences in the development of these systems, and they cannot be treated in the same manner as those we have already considered. The practical moralist can determine that morality consists not in the satisfaction of the tendencies of our nature as such, but on the government of these tendencies by reason. He can also perceive that reason judges between these tendencies, and recognizes an excellence in some which it does not recognize in others, and that the greater satisfaction of the tendencies themselves is not the sole ground of these judgments; but when we come to inquire what is the source of the laws by which reason governs our actions, and in what these laws consist, we reach questions which can only be answered by an examination of the psychological grounds of ethics too extensive to be here entered on. We shall only indicate a few results which we believe may be established.

We may go a step further in our deductions from practical morals, and say that the ethical notions commonly held and acted on by men have a common and easily recognizable source in the belief in a Supreme Being. It is this belief which gives the sanction of obligation even to the utilitarian motive itself; for, if I believe that my being originates in the will of a Being of infinite perfection, I naturally conclude that there is some perfection to which my being tends, and that I am under an obligation to seek it. It is this also which reconciles the conflicting claims of self-interest, and of the good of our neighbours, which it would otherwise be a matter of the extremest difficulty to adjust, and this gives a broad and sure foundation for society.

The idea of a Supreme Being may be the source of the moral notions of an individual in either of two ways. He may deduce these notions himself from that idea, whether conceived by himself, or communicated to him by another, or he may receive the notions from those who have so deduced them. In like manner the idea of a God may be formed in the mind of the individual who holds it as a deduction of reason, or it may be communicated to him by others.

However this idea originated it actually exists, and there are only two possible ways in which the human race can have become possessed of it. It must either have been conceived by some individuals as a deduction of reason, and communicated by them to others, or it must have been communicated to some individuals of our race by a superhuman authority, in other words by revelation.

There is nothing repugnant to reason in the idea of a revelation. If we receive ideas on the most important subjects from one another, why should we reject ideas which may be communicated to us in like manner from a higher source? But a revelation is possible only on one condition, that it should be consonant with reason. Whether, therefore, the idea of a God comes to us from reason or revelation

it depends upon reason alone to receive it. If it is deduced by ourselves we must have the power of reasonably deducing it, if it is communicated we must have that of reasonably assenting to it.

We hold with Descartes, the father of modern philosophy, that we have this power, and we hold also that it is from the recognition of our relationship to God that the orderly development of moral ideas proceeds. We hold that the existence of God is a necessary truth of reason. We do not mean by this that it exists *a priori* in human intelligence, for then all men would have it; but that it is a necessary result of the due exercise of that intelligence upon the problem of its own being, in the same manner as the truths of mathematics are necessary deductions of reason to those only who examine the evidence on which they depend.

ETHIOPIA, or **ÆTHIOPIA** (Greek, *Æthiopia*; Hebrew, *Cush*). The terms Ethiopia and Ethiopian were anciently used in two distinct senses. First as a generic designation applied by the earliest geographers to all the dark-coloured races of Africa, or even of Africa and Asia. Herodotus used it in the latter sense. Secondly as the general name given to the countries lying to the south of Egypt and Libya, and extending from the Red Sea to the Atlantic Ocean. In a more restricted sense it comprehended the modern country of Nubia and part of Abyssinia, and had Meroe for its capital, but its limits were not very clearly defined. The principal tribes or races of the Ethiopians known to the Greeks and Romans were the Blemmyes and Megabari, agricultural races; the Ichthyophagi, or fish-eaters, who dwelt on the sea coast; the Macrobii, or long-livers; the Troglodyte, or dwellers in caves. The Greek and Roman accounts of Ethiopia are not only very vague, but frequently filled up with fable. The history of ancient Ethiopia is closely connected with that of Egypt; its details are in a great measure fabulous, but it appears to have been a very powerful and early civilized nation, and according to some the arts and sciences descended from thence into Egypt. Ethiopia is mentioned in the Bible as in close connection with Egypt, and on two occasions the Ethiopians even appear in the field of Jewish history. The first of these was in the reign of Asa (about B.C. 955), against whom Zerah the Ethiopian came with a great host, and was defeated and driven back at Mareshah, in the extreme south of Palestine. The second occasion was in the reign of Hezekiah, when Tirhakah, by making war against Sennacherib, helped to divert the attention of the Assyrian monarch from the kingdom of Judah. By Ethiopia in this connection we must understand Ethiopia and Upper Egypt combined. Almost the only other allusions made in Scripture to Ethiopia refer to the natural characteristics of the country, and the commerce in which its people engaged.

The **ETHIOPIAN LANGUAGE** or *Geez*, the literary and ecclesiastical language of Abyssinia, is a Semitic language allied to the Arabic, and was introduced by the settlers from south Arabia. It became the official language of the country, but was supplanted in the fourteenth century by the Amharic, through a change of dynasty, after which it died out as a spoken language, and maintained itself only as the language of literature and the church. It resembles in many respects the Aramaic and Hebrew, as well as the Arabic, but has many peculiarities of its own. It has twenty-six consonants, and seven vowels, which latter are always written, and it is written from left to right, thus differing from the other Semitic languages. The Ethiopian literature begins after the introduction of Christianity in the fourth century, and is almost entirely connected with the

chroch. The principal work is a translation of the Bible, including the Old and New Testaments and Apocrypha, to which are appended some non-canonical writings, such as the Shepherd of Hermas and the Book of Enoch. For the Ethiopian or Abyssinian Church, see ABYSSINIA and COPP.

ETHIOPS MINERAL, a name given by the old chemists to the black sulphide of mercury, prepared by rubbing mercury and sulphur together, either hot or cold. *Ethiops martis*, or ethiops of iron, was the black oxide got by exposing iron-filings and water to the air.

ETHNOLOGY (Gr. *ethnos*, race, tribe, and more generally people, nation; and *logos*, discourse) is that branch of *anthropology* (the science of man in general) which deals with the various branches of mankind in detail. It differs from *ethnography*, which is purely descriptive, in that it attempts to co-ordinate all the known data bearing on the interrelations of the various members of the human family, viewed, not as isolated groups, but as mutually related divisions of mankind, here regarded as a single genus—*Genus Homo*—with one or more species according to the different views of anthropologists on its specific unity or diversity. To discuss this and similar fundamental questions intelligently, it is obviously necessary to treat of the origin, antiquity, migrations, physical and mental characters, cultural developments, social, linguistic, and religious conditions, of the several groups, not as independent units, but as interconnected divisions and subdivisions of the genus.

These various topics do in fact form the proper subject of ethnology, taken not merely as descriptive literature, but as a science based on inductive principles, and proceeding on the comparative method. A single example may serve to put in a clear light the different aspects from which the question may be viewed, and thus explain the distinctions here insisted upon. The account given by Tacitus (*Germania*) of the Germanic peoples is *ethnographic*. The observer takes them as he finds them, and draws a vivid picture of their physical appearance, temperament, social and political systems, without any reference to their origin or possible connection with the surrounding peoples, although his object is by contrast to reflect on the then condition of the Roman world. Again, the numerous studies made by Virchow of the remains from the prehistoric graves in Germany, belong to the special branch of anthropology which has comparative anatomy for its base. Lastly, the inquiries made by Penka into the obscure relations of the early Germanic tribes with their neighbours, the object being to determine their position as a race amongst the other European races, are *ethnological* in the strict sense of the term. At the same time it is evident that in this, as in all other branches of knowledge, there must be overlappings and encroachments on special departments; and as the geographer has to touch on geological matters below, and meteorological matters above the crust of the earth, the ethnologist cannot dispense with the light thrown on racial questions by such allied subjects as physical anthropology, archæology, philology, history, and the rich ethnographic materials accumulated by travellers, missionaries, and explorers.

The first question bearing on the natural history of mankind is concerned with its origin in place and time. As regards time, there is now not merely a consensus of opinion amongst anthropologists, but overwhelming proof, that man had already made his appearance, not in one or two localities, but in nearly all the habitable parts of the world, in the pleistocene (quaternary) period. (See GEOLOGY.)

Rude stone implements called *palæoliths* (Gr. *palaio*, old, and *lithos*, a stone), which have been found in abundance in Britain, France, Egypt, Tunisia, Somaliland, South Africa, Western Asia, India, Indo-China, and the New World, give their name to the *Palæolithic* or *Old Stone Age*. Great numbers of these objects have been found *in situ*, that is, in the undisturbed glacial drift (sands, gravels, boulder-clays) of the Ouse, Thames, Somme, Nile, and other streams, which have since scoured their beds down to depths of 50, 100, and even 400 feet. In Tunisia they occur in abundance under a thick bed of quaternary limestone deposited by a stream which has since disappeared. Many have been recovered from Kent's Hole and other caves beneath great masses of stalagmite, while others again are found in association with the now extinct pleistocene fauna—large and pigmy hippopotamuses, cave bear, woolly rhinoceros, mammoth, sabre-toothed tiger—which at that time migrated with the changes of climate to and fro between Europe and North Africa. All the conditions thus show that the period when such objects were fashioned by the hand of man must date from the first interglacial epoch, to which an antiquity of from 300,000 to 500,000 years has been assigned.

This Palæolithic Age, during which great progress was made, as attested by the improved character of the implements and in some places (south of France) their artistic carvings, gradually merged in the *Neolithic* (*neos*, new; *lithos*, stone) or *New Stone Age*, the megalithic monuments of which girdle the globe. This epoch acquired its greatest development in North Africa including Egypt, in the *Ægean* lands, in Iberia, Brittany, the British Isles, Denmark, parts of Central Europe and of the New World. In Scotland the Neolithic Age lasted long enough to witness the formation of the Carse clays, which now stand 40 or 50 feet above sea-level, but then formed the bed of a sound or estuary extending almost if not quite across the land between North and South Britain. It is even suggested by Sir W. Turner that, after the separation of Britain from the Continent in interglacial times, another land connection, a 'Neolithic land-bridge', may have enabled the men of the New Stone Age to reach Scotland when the upheaved terrace was still clothed with the great forest growths that have since disappeared.

A duration of about 100,000 years has been assigned to the New Stone Age. But of course all such calculations are largely guess-work, there being no precise dates or data whereby such phases in the evolution of mankind might be chronologically determined. It is also to be noticed that these epochs themselves—Old and New Stone Ages—are chronological sequences only in a relative sense, and only in those regions—Egypt, Western Europe—where they are known to have followed each other in consecutive order. In most parts of the habitable globe there are not only endless overlappings and interminglings of the primitive and later phases, but persistence and survivals even of the rudest cultural stages down to the present time. Such survivals of old and new, such persistence of low cultures often in the midst of more highly advanced peoples—Vaalpens among the Transvaal whites, Australian aborigines among European settlers—tend to obscure the time relations. It is obvious, for instance, that implements of the rudest types, such as those of the recently extinct Tasmanians, or of the Bushmen and Botocudos, more primitive than those of the European palæolithic hunters, cannot of themselves be any test of age. They represent no sequences, but only an incipient growth arrested by adverse conditions, and prevented from attaining its normal

development. Where there is no change there is no standard wherewith to measure time.

The main features of the palaeolithic and neolithic cultural eras are found to be very marked in all those regions where they can be studied in orderly sequence. This is well seen in Central and Western Europe and in Britain, where the largest number of observations have been recorded. Subjoined is a table of the primitive and later European cultures prior to the introduction of the metals, arranged in a form convenient for comparative study:—

PALÆOLITHIC CULTURE.

Fire, at first known only, later partly under control—could be preserved when kindled by natural means.

Food, at first mainly vegetable, then animal, obtained by hunting and fishing only, mostly perhaps eaten raw.

Industries, limited to the making of stone and bone implements, never ground or polished, but of progressively improved types, and later, embellished with artistic carvings, chiefly of the mammoth, horse, and other contemporary animals.

Monuments, none; no houses, graves or burial; habitations mainly caves and rock-shelters; no permanent camping-grounds or stations, except for quarrying and working flint and other stone implements.

Religious ideas, none (?).

Social groups, the family; later, the clan.

NEOLITHIC CULTURE.

Fire, under complete control—could be artificially kindled and preserved.

Food, vegetable and animal, obtained by hunting, fishing, stock-breeding, and tillage; mostly cooked.

Industries, polished stone implements of diverse types, spinning, weaving, mining, pottery hand-made without the wheel, poorly ornamented; artistic sense low at first, later well developed.

Monuments, very numerous and varied—monolithic, megalithic; mounds, barrows, dolmens, menhirs, pile-dwellings, aquatic stations, crannogs, kitchen middens, kurgans, nuraghi.

Religious ideas, well developed; funeral rites general. *Social groups*, the family, clan, tribe, and nation.

After the Stone followed the Metal Ages—*Copper*, *Bronze*, *Iron*—which in a sense still persist, because, once introduced, the metals, unlike stone, could never be discarded as the raw material of human implements. But they date back to such remote times that all memory of their invention has perished, and we can only say with Lucretius:—

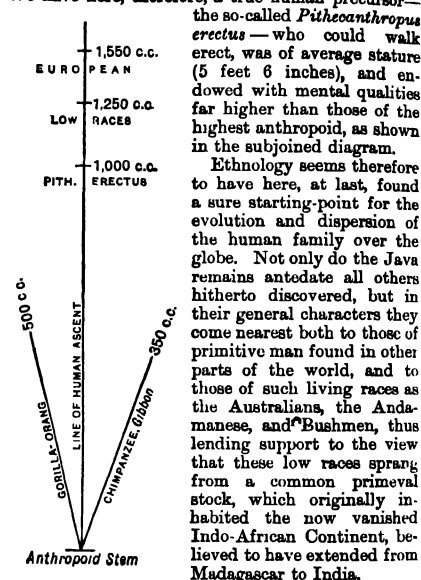
*Posteriori ferri vis est aerisque reperta,
Sed prius aeris erat quam ferri cognitius usus'.*

A 'Prehistoric Age' is also spoken of, which, however, presents no distinct outlines. It comprises that vague period between the discovery of the metals and the invention of letters, dim echoes of which—popular myths, folk-lore, demi-gods, eponymous heroes, traditions of real events—lingered on into historic times, and supplied ready to hand the copious materials afterwards worked up by the early minstrels, the founders of new religions, and later legislators.

With the revelations made by archaeologists amid the monumental remains and records (cuneiform and hieroglyphic writings, rock inscriptions) in Egypt, Babylonia, South Arabia (Minaea, Sabaea), the Ægean lands (Crete, Cyprus, Troy, Mycenæ, Argos, Tiryns), Italy, Iberia, the strictly historic period itself is constantly receding farther into the background, and we are now told that the Mesopotamian city of Nippur possessed a history some 8000 years old. Thus is approached the period of 10,000 years, which may have to be assigned to the Historic Age before the archaeological exploration of Egypt and Babylonia is exhausted.

The question of time being thus answered, that of place—the cradle of humanity—becomes somewhat easier and less speculative since the discovery in 1892 of human remains by Dr. Eugene Dubois in the pliocene beds of East Java. The heated dis-

cussion to which this discovery gave rise has already subsided, and the conclusion of Manouvrier, Deniker, Hepburn, and many other competent authorities, that the remains—a femur, two molars, and portion of a skull—are those of a human precursor, is now generally accepted. About the femur there never was much doubt, while the enormous capacity of the skull (900 to 1000 cubic centimetres, not much less than that of some of the lowest living races) shows that it could not belong to any of the allied anthropoid species—gorilla, orang, chimpanzee, and gibbon—none of which even now exceed 500 c.c. We have here, therefore, a true human precursor—the so-called *Pithecanthropus erectus*—who could walk erect, was of average stature (5 feet 6 inches), and endowed with mental qualities far higher than those of the highest anthropoid, as shown in the subjoined diagram.



From our diagram it further appears that according to evolutionary teachings man does not descend, or rather ascend, from any of the living anthropoid groups as is commonly asserted, but shoots up in an independent line of development from some long-extinct generalized form, from which the other branches also spring in divergent lines of growth. In order to allow time for such developments as we now see in the highly specialized allied members of the anthropoid family, the common stem or starting-point must be set back to early tertiary, or at all events miocene times, when we know that many of the higher mammals, amongst them *Pliopithecus*, allied to the gibbon, and *Dryopithecus*, perhaps allied to the chimpanzee, had already made their appearance, and had ranged over wide areas between Southern Asia (India) and Europe.

But the pliocene descendant of such a postulated miocene human precursor is not known to have travelled so far afield, and his range, like that of his living congeners, may very well have been limited to intertropical lands. The fossil human remains found elsewhere, and especially in Western Europe and South America, are considerably in advance of the pliocene Java type, as is clearly seen by comparing the skull with that, for instance, of the Palæolithic man of Spy (Belgium), which was discovered in 1886, and holds an intermediate position between *Pithecanthropus erectus* and the Cro-Magnon (Neolithic) race of Dordogne (south of France). These two later races are representatives,

not of pliocene, but of early and late pleistocene man, who, as above shown, had already ranged over the globe in interglacial times. If, as may now be assumed, the point of dispersal was Java, or Indo-Malaysia generally, the migrations of this cosmopolitan species may be followed without great difficulty by bearing in mind the distribution of land and water in the early pleistocene period. At that time the Indo-African Continent, the existence of which has been established by the geologists of the Indian Geological Survey, had not yet vanished, and presented considerable tracts of dry land through the Seychelles and other islets across the present Indian Ocean between India, Madagascar, and South Africa. The shallow inland waters, even now scarcely fifty fathoms deep, had not yet submerged the connecting areas between Borneo, Java, Sumatra, and the Asiatic mainland. The Australian Continent stretched across Torres Strait to New Guinea, and extended westwards much farther than at present. New Zealand also occupied a much larger area than it now does; while the deep borings (1897) in the coral atoll of Funafuti, in the Ellice group of Pacific islands, show that Polynesia itself is an area of comparatively recent subsidence. In the northern hemisphere Africa was connected with Europe across the Strait of Gibraltar, between Tunisia, Pannetaria, Sicily, Malta, and Italy, and also farther east across the Aegean waters. Lastly, Britain still formed part of the European mainland, while almost continuous land appears to have extended in both directions across Behring Strait to Alaska, and from North-west Europe through Iceland to Greenland and North America. Here are therefore abundant land connections by which pleistocene man may have gradually spread from his Indo-Malaysian cradle to the uttermost limits of the habitable globe. If the routes here suggested may still be somewhat speculative, the migrations themselves are, as seen, established facts, which can be set aside only on the assumption of the independent evolution of the various human prototypes in different geographical areas. The question thus becomes one of the monogenist as against the polygenist view of human origins. The polygenist, who rejects the unity of the human family, and holds that the main divisions were separately evolved, each in its own zoological area, may of course dispense with a human cradle, a common point of diffusion, and primeval migrations. But he finds himself confronted by other and far more formidable difficulties, some of which are quite conclusive against the specific diversity of mankind. He has, for instance, to account for the American aborigines, who constitute one of his independent human species, and who nevertheless make their appearance in a region where none of the allied anthropoids ever existed. Thus the polygenist's *Homo Americanus* has no precursor, or a precursor as low down in the scale of mammalian life as the *Cebida* and *Ilapalida* (marmosets and the like).

A still stronger argument against polygenist views is based on the physiological fact that all races, the highest and the lowest, are fertile *inter se*, so much so that scarcely any living peoples are of pure stock, the immense majority being the outcome of almost universal miscegenation. Such are the Bantus, a cross between Negro and Caucasian elements dating from prehistoric times, still going on, and occupying about half the African continent; the Hispano-American and Lusitano-American peoples of the New World, thoroughly established, and ranging from Mexico to Argentina; the Turks, Finns, Magyars of Hungary, Bulgarians, Hazaras and Aimaks of Afghanistan, all of whom are blends in divers

proportions of Caucasian and Mongolic elements; the Malagasy islanders, mostly sprung from Malay (Mongol) and Bantu (Negroid) interminglings; the South African Griquas, who are Hottentot-Dutch half-breeds. Such universal fusions, for the most part stable and vigorous, would be impossible between specifically different races, as is seen in the sterile mule, a cross between two equine species. Hence it is that most anthropologists are now monogenists, rejecting the polygenist views, and regarding mankind as a true family genetically related, and consequently sprung from a single stock originally evolved most probably in Indo-Malaysia.

From this cradle the world must have been peopled by the above-indicated routes, for there are no others; and as the peopling took place in early pleistocene times (see above), it follows that all existing populations are sprung from a generalized pleistocene human prototype. The osseous remains and primitive arts (stone implements) of this prototype are everywhere, not merely like, but identical in form, allowing for difference of material, 'so identical that they might have been manufactured by the same hands' (Sir J. Evans). The conclusion is irresistible, that the world was peopled by the same generalized proto-human form, prior to all later racial differences. These differences and specializations were consequently evolved in due course, each in its special geographical area, by continuous natural selection and adaptation to their several environments. Thus the four generally accepted primary groups—ETHIOPIAN or NEGRO, MONGOLIC or YELLOW, AMERICAN or COPPERY-BROWN, and CAUCASIAN or WHITE—have each their pleistocene ancestor, from whom they descend in slightly divergent or almost parallel independent lines, and need no longer be derived one from the other—black from white, white from yellow, and so on—always a difficult and improbable assumption.

After the divergences, by which these primary groups were established, came the convergences, some in remote times, others more recently, but all resulting in the above-described interminglings, modifying and even blurring the original types, and greatly increasing the difficulties felt by systematists in their efforts to classify these multifarious divisions and subdivisions of mankind. There is reason to believe that the highly specialized primary varieties had already been fully constituted before the close of the Old Stone Age. In Egypt, for instance, where Oppert finds traces of a well-developed social and political organization dating back to over thirteen millennia, Prof. Petrie brought to light in 1897 the portrait statue of Prince Nenkheftka of the fifth dynasty (3700 B.C.), a man of 'European features'. Still older is the portrait of Enshesagana, king of the Akkads (4500 B.C.), with perfectly regular features, which might be either Semitic or even 'Aryan'. Thus we have documentary evidence that the Caucasian type had already been not only evolved but spread over a wide area (Egypt and Babylonia) some thousands of years before the new era. Such an evolution must have taken long ages to accomplish, so that it seems reasonable to infer that all the primary groups had already been fairly differentiated, as they now exist, at all events in early Neolithic times. Since then the races of mankind have been perpetually on the move, and had certainly begun those later developments, hostile and peaceful relations, which continued with little interruption after the first peopling of the earth by pleistocene man. Thus were brought about those profound displacements and dislocations, followed by fresh ethnical groupings, by which the physical and other characters of the parent stocks were often deeply

modified, or even effaced. Thus were lost beyond recovery many of the connecting ties between past and present generations, and the ethnical, like the geological, record remains to some extent a mutilated chapter in the history of humanity. But by the combined efforts of physical anthropologists, linguists, and archaeologists, some of the gaps have in recent years been bridged over, and it now becomes possible to follow with some profit the prehistoric movements of historic peoples, such as the Pelasgians, Ligurians, Iberians, and others in Europe; of Jata, Rajputs, and Galchas in Asia; of Bantus in Africa; of Aztecs, Mayas, and Aymaras in the New World. A reconstruction has even already been attempted of the ethnical history of the widely-diffused Mediterranean nations, who occupy the borderland between prehistoric and historic times, and still form the substratum, in some places even the bulk, of the present North African, Hellenic, Italic, Iberian, South French, and British populations.

But here a warning note has to be sounded. The scientific study of speech antedates the scientific study of mankind, and the correct principles of philology had been roughly formulated while ethnology was still in the empirical state. The inevitable result was, that the linguist, identifying language and race, usurped the ethnical domain, and set up a direct antagonism between philological and anthropological studies and methods, which still persists. Profound questions of origins, as, for instance, of the 'Aryan' race, were decided exclusively on linguistic grounds, even before the existence of such a race had been proved, and the conclusions arrived at on the strength of strained etymologies were and are still, current long after the existence of an Aryan race has been disproved. It should therefore be clearly understood that race and speech do not necessarily coincide, and that a widely-diffused linguistic family, such as the Aryan, or the Malayo-Polynesian, does not, cannot, imply the existence of a corresponding widely-diffused ethnical family in the absence of uniformity in the physical characters. Thus the Melanesian and Philippine Islanders, the Malayan peoples of Sumatra and Java, those of Madagascar, the Micronesians, and the Polynesians (Samoans, Tahitians, Maori, Hawaiians), all speak distinctly related branches of the Malayo-Polynesian or Oceanic stock language; but they are not themselves interrelated, except so far as all are remotely connected members of the human family. They belong to three different ethnical stocks—Negro (Melanesians and others), Mongol (Malays and others), and Caucasoid (Polynesians and others); and their common Oceanic speech merely proves that we cannot argue from language to race, and that a language may be imposed upon, or adopted, by a people without any corresponding change in their racial type. Many Celtic peoples now speak English or French; the Romans imposed their Latin tongue on Etruscans, Iberians, Gauls, Lusitanians, and others, who now consequently speak neo-Latin tongues (Italian, Spanish, French, Portuguese), but are not on that account either Romans or Latins.

But it must not be supposed that language is therefore valueless in ethnological studies. On the contrary, it is a most useful and often indispensable aid, provided that it be used with judgment, and its principles be properly determined. One principle of paramount importance, but almost wholly overlooked, is, that while races, as we have seen, intermingle, and miscegenation is the normal condition of the present inhabitants of the world, languages do not mix at all, that is, in their mechanism or inner structure, or the phenomenon is so rare and partial that it may be neglected in the present

consideration. Momentous consequences follow from this new well-attested fact. For instance, the Malagasy are a mixed people, in whom a black strain is conspicuous, and speaks for itself. But the other element or elements of the blend are not at all conspicuous, and could never be determined by cranio-logical or other anatomical studies, as plainly shown by the contradictory statements of special anthropologists on the subject. Now, it so happens that all without exception speak a very pure form of Malayo-Polynesian speech, necessarily unmixed in its structure (in accordance with the principle above stated), and but slightly in its vocabulary. It further shows direct relations with the sister tongues of Sumatra, Java, and other parts of Malaysia, but, unlike them, has no borrowings from Sanskrit, which was introduced into the Archipelago by the early Hindu missionaries. We therefore confidently conclude that the chief unknown element in the Malagasy Negroid blend came from Malaysia, and arrived at an early date, prior at all events to the spread of Hindu influences throughout that insular world. Again, the few loan words in the language are found to be Arabic, but of an archaic type, the Himyaritic Arabic, which was current in South Arabia in remote pre-Mohammedan times, and has been recovered from the rock inscriptions of the ancient Sabeian and Minean empires. Compare, for instance, the first two days of the week:—

	SUNDAY.	MONDAY.
Malagasy	Alahady	Alatsinany
Himyaritic	Al-ahadu	Al-itanan
Later Arabic (of the Koran)	El-ahad	El-itsna

We therefore again infer that the ancient Himyarites had relations with Madagascar, and may, as suggested by the late Theodore Bent, very well have been the foreign people who worked the gold-mines and built the Zimbabwe monuments in the neighbouring districts south of the Zambesi (Manica, Matabilland). Speech, therefore, may prove an invaluable help in ethnological inquiries.

By philologists languages are grouped in three, or at most four, great categories, or morphological orders, which are determined by their inner structure or the absence of structure. The orders, as explained in art. PHILOLOGY, are: the *Monosyllabic* or *Isolating*, the *Agglutinating*, the *Poly-synthetic*, and the *Inflecting*, under each of which are comprised many stock languages, that is, languages which have become so specialized that they can no longer be reduced to a common source. The fact is undeniable, but the inference drawn by some polygenists from the fact proves too much, and therefore proves nothing. They argue that the irreducible languages represent irreducible species, and have even tried to fix the number of such species at from about eight to sixteen. But the stock languages, past and present, are numbered, not by tens or scores, but by hundreds (in America alone at least 150), and no polygenist pretends to say that the independent human species are equally numerous. The great number of stock languages merely proves once more that speech and race are not one, and consequently that to argue from one to the other is bad logic.

At the end of this article the reader will find, arranged in tabulated form, the chief divisions and subdivisions of mankind, with their former and present domains, estimated numbers, physical and mental characters. To complete the picture, a few general remarks are here appended on such details as could not well be brought into the tabulated scheme.

It should be explained that the scheme itself is

ETHNOLOGY.—I. ETHIOPIA OR BLACK DIVISION OF MANKIND.



1. Fulah (aberrant Sudanese type). 2. Mandingo (Sudanese Negroid type). 3. Nuba of Kordofan (full blood Negro). 4. New Britain Warrior (Oceanic Negro mixed type). 5. South Bantu type (the Bechuana chief Khama). 6. Oceanic Negrito Type.

based, as far as possible, on the principle of correlation of parts. Such correlation, where, for instance, blue eyes harmonize with very light-brown or flaxen hair, a florid complexion, large straight nose, regular and more or less oval features, tall stature and robust frame, resulting in a blond type commonly called Germanic, North European, or simply European (Lin. *Homo europæus*), may be assumed to have been somewhat complete in the early stages of development. But, owing to the later migrations, interminglings, and even changes of environment, these ideal types have long ceased to exist in their integrity, or occur at most in a few individuals, especially women and children, or in one or two isolated areas, such as the Andaman Islands or Tasmania. In some places an astonishing uniformity prevails, so that all the members of a tribe, such as the *Kai Colos* of Fiji, seem to be exactly alike, a whole series of skulls presenting scarcely any appreciable deviations. But such uniformity is naturally confined to a few secluded groups amongst the lower races. Elsewhere the harmony is greatly disturbed, and the systematist has to be satisfied with a continuously diminishing number of correlated features, enough, however, to afford a firm basis for the four broad divisions now commonly accepted, and even for several of the subdivisions under each primary group.

In this respect the most valuable physical criteria are found to be: 1. *The hair*—long, lank, and black; short, woolly or frizzly, and black; long, straight, wavy, or curly, with all shades of brown, golden, red, and even black. 2. *The skin*—very dark-brown or black, and glossy; yellowish, yellowish-brown, or olive, coppery or slightly reddish, and smooth or hairless; white (pale or florid), and more or less hairy, or even hirsute, with full beard. 3. *Lower jaw*—either projecting (*prognathous*; Gr. *gnathos*, jaw), or straight (*orthognathous*; Gr. *orthos*, straight), or medium (*mesognathous*; Gr. *mesos*, middle). 4. *Nose*—either short and broad (*platyrrhine*; Gr. *platys*, broad, flat; *rhis*, gen. *rhinos*, nose); or long, straight, hooked; or aquiline and thin (*leptorrhine*; Gr. *leptos*, thin, slender). 5. *Lips*—either thick, tumid, and everted, showing the red inner skin; or thin, straight, and compressed; or intermediate (lower lip slightly everted and pendulous). 6. *Eye*—large, round, straight, and black, with yellowish sclerotic; small, narrow, slant, and black, with loose inner tegument or fold; straight, medium-sized, and round, with all shades of brown, blue, hazel, and even black iris, and white sclerotic. 7. *Cheek-bones*—either projecting, high or small, with corresponding angular, irregular, and regular features. 8. *Skull*—either round and short (*brachycephalous*; Gr. *brachys*, short, *kephalê*, head); or long and narrow (*dolichocephalous*; Gr. *dolichos*, long); or medium (*mesocephalous*). In determining this important cranial character, what is called the *cephalic breadth index* is found by multiplying the transverse diameter by 100, and dividing by the long (antero-posterior) diameter measured from the glabella (space between eyebrows) to the occiput. The resultant index figures vary from about 85 to 95, skulls below 75 being classed as long, those above 83 as round, and the intermediate as mesocephalous, which are again classed either as sub-dolicho or sub-brachy, according as they fall below or rise above a medium index of 77 or 78. Lastly, 9. *Stature*, which recent exploration shows to have a wider range than had been supposed, varying from 4 feet, or even less (as in some African Negritos, Vaalpenses), to 6 feet 4 inches and upwards (Brazilian Bororo, Abyssinian Wallamot).

Applying these racial tests to our primary divisions it will be found that, although the ideal types

are now blurred, sufficient remains to justify the classification. Thus, nearly all African and Oceanic Negroes are characterized by very dark-brown and even blackish skins; rather short, woolly or frizzly, black hair; projecting lower jaw; round straight black eyes; and dolichocephalous head; while stature, nose, and lips vary not a little. Similarly, nearly all Mongols are yellowish or yellowish-brown; with long, lank hair of the horse-tail type; small, slant, black eyes; prominent cheek-bones; short or medium stature; mesognathous jaw; brachy- or mesocephalous head; short nose; and thin lips. The American is not so uniform as generally assumed, and great discrepancies are presented, especially in the stature (from under 5 to over 6 feet); in the complexion (coppery-red, dark-brown, yellowish, leathery and almost light); in the skull (all shades of dolicho- and brachycephalism); and in the features (some almost Caucasian in their regularity, others broad, coarse, and heavy). But the unity of the type is shown in the very long, black, lank hair; the large straight or aquiline nose (not, however, constant); the rather small, straight, and round black eyes; and a somewhat indefinable general expression, by which all the aborigines are at once recognized.

Some remarkable deviations are also presented by the Caucasian division, especially in the hair (straight, wavy, curly, and even frizzly; black, red, flaxen, towy, and all shades of brown); in the skull (from 73" to over 90", and even 95"); in the complexion (florid, pale, swarthy, olive, brown, and even blackish); in the eye (black, blue, gray, brown); in the stature (5 ft. 1 in. to 6 ft. 2 or 3 in.); in the nose (large, straight or aquiline; short, snub, or concave). To explain these differences, which so greatly affect the uniformity of the Caucasian division, various theories, often conflicting and antagonistic, have been advanced, and will be briefly referred to farther on. Here it may suffice to point out that the whole of the Caucasian domain, comprising the most favoured lands on the globe—North Africa, most of Europe, Western Asia—has from remote times been a region of intense miscegenation, resulting in considerable variations within certain limits, and, whatever view be taken, presenting great difficulties to all systematists. So true is this, that many of the proposed classifications are based more on linguistic than on physical grounds, and, for instance, Kelts, Teutons, and Slavs are grouped together because of their common Aryan speech. But, as seen, this is a classification, not of races, but of languages. Some of the difficulties also disappear when it is seen that many of the characters are of minor importance, and perhaps due more to social than racial causes. Thus, all shades of hair and eyes occur in the same locality, and even in the same family, while the eminent French anthropologist, M. de Lapouge, refers the transitions from dolichocephaly to brachycephaly entirely to social causes.

To such causes must largely be attributed the differences everywhere observed in the cultural groups, where anthropologists clearly distinguish between the refined and coarse types of the upper and lower classes, with the intermediate transitional forms of the middle classes, which give the racial averages. In large cities the tall, symmetrical figures and regular features of the 'upper ten' stand out in striking contrast to the low, and sometimes even debased, form of the proletariat in the manufacturing quarters, although even here original racial strains may not be entirely absent.

THE ETHIOPIAN DIVISION.—It will be noticed that the two sections of this division—the African and Oceanic—are at present separated by the waters of the Indian Ocean. But their primordial unity

and coexistence in a continuous geographical area before the subsidence of the Indo-African Continent (see above) are attested, not only by the striking resemblance in their physical and mental characters, but also by the curious coincidence of a *Negrïto* or *Negrillo* sub-group in both sections. A distinction is sometimes drawn between these two Spanish diminutives of *Negro*, the former being applied to the western, the latter to the eastern dwarfish peoples. Although not generally accepted, the distinction is convenient, because the African *Negrïto* differs in some respects from the Oceanic *Negrillo*, being considerably shorter, more hirsute, and of a lighter colour—reddish or yellowish rather than dark-brown or black. A connecting link, however, is presented by the *Vaapenses* of North Transvaal, who are pitch-black, little over 4 feet high, and perhaps the most primitive of all the pygmy tribes. The *Akkaas*, *Batwas*, *Andamanese*, *Samangs*, and *Astas* are at least nimble hunters, and possess the bow and poisoned arrow. But the *Vaapenses* have not even stone or any other weapons, except what they procure by barter or in return for services rendered to their white neighbours. They have no clothes, no dwellings, except rock shelters and holes dug in the ground, no chiefs or tribal organization of any kind. Of all dwarfish peoples the *Vaapenses* alone are cannibals, devouring both the aged and the infirm, so that they occupy perhaps the very lowest social position of all human communities.

Considerably more advanced are the neighbouring Bushman hunters, who have bows and darts, and digging-sticks weighted with whorls, and formerly ranged all over South Africa, as far north as Nyasaland and Lake Tanganyika. Although despised, and formerly hunted down by all the surrounding peoples, the Bushmen have inherited mental qualities of no mean order, as shown in their rich oral folk-lore literature, and in the artistic taste with which they decorate their caves and rock-shelters with animated scenes of war and the chase. The Bushman language is distinguished by a number of inarticulate sounds called 'clicks', and this feature it shares with that of the neighbouring Hottentot peoples. See HOTTENTOTS.

Of the two great sections of the African Negroes proper—*Sudanese* and *Bantus*—the former are the less progressive, and on the whole the more debased, except where they have been raised in the social scale by miscegenation with higher races—Saharan Berbers, Gallas, Arabs, and other Hamites and Semites. Here the contrasts are enormous, for instance, between the full-blood Negro Felups of Senegambia, mere savages of a very brutal type, and the mixed Negroid Mandingans, Songhays, Hausas, Kanuri, and Baghirmi of West and Central Sudan, who live in great cities, cultivate the land, practise many industrial arts, possess historic records going back fully a thousand years, are mostly Mohammedans, and have founded large mediæval empires, one or two of which still survive.

Sudan is a field of great linguistic confusion. From remote times a multiplicity of tongues have here been current, which must represent at least fifty stock languages, such as Yoruba, Ibo, Kru, Timni, Songhay, Mandingan, Wolof, Bolo, Mishi, Hausa, Kanuri, Baghirmi, Maba, Mosgu, Fâr, Tumali, Nuba, Bari, Shuli, Dinka, Shilluk, Gô, Kalaka, Mangbattu, Momfu, Zandeh (Niam-Niam), Barambo, Naakkara, and many others. All seem to be of the same agglutinating Negro type—root with infixes and postfixes—but beyond this general morphological feature have little else in common.

In this respect the contrast could not be greater than that presented by the innumerable Bantu populations, amongst whom complete linguistic uniformity everywhere prevails, without any known exception, over an area of some 6,000,000 square miles. Not that all speak mutually intelligible dialects, far from it; but all speak more or less closely related languages, which derive beyond all question from a now lost mother-tongue. The phenomenon is not unique, for such widely-diffused linguistic families—Aryan, Hamitic, Semitic, Mongolo-Turki, Algonquian, Guarani, Oceanic—occur also in other parts of the world. But Bantu has this peculiarity, that although of extremely delicate mechanism, with pronominal and other prefixes causing concordant alliteration, it has for many ages everywhere preserved this structural system amid a multitude of illiterate, barbaric, and even savage populations. We recognize instantly any member of the Bantu family, whereas it requires profound philological analysis to discover that, for instance, English, Russian, Welsh, and Persian are members of the Aryan family, or have anything at all in common.

The Oceanic, like the African Negroes, form two great sub-groups—*Papuanian* and *Australian*—which also present some remarkable contrasts. The Papuanian, which comprises the Papuans proper and the Melanesians, preserves more of the original Negro physical characters than does the Australian; which must be regarded as a somewhat aberrant branch of the division. While the Papuan hair is always frizzly, forming the characteristic 'mop-head' familiar to travellers in New Guinea, the Australian is, on the contrary, rather wavy and tangled, with a full shaggy beard, the whole presenting the aspect of a European unkempt shock head. In their speech also the two sub-groups present the same contrasts as in Africa—great linguistic disorder in New Guinea, considerable uniformity in Australia, where all the languages have the same phonetic system and the same agglutinating structure, as if all had diverged from a common source at some very remote epoch. Even the notation is the same, no Australian language possessing radical terms for any of the numerals beyond 8, or possibly 4 in one or two cases. Practically they stop at 2, after which we get 2+1, 2+2, much, many, and so on. The Papuan arithmetic is equally limited, whereas the Melanesians, who speak greatly divergent dialects of the Malayo-Polynesian language, count readily up to 100 and even 1000. The Melanesians are also more highly endowed mentally, as seen in their religious ideas, in their cosmogonies, and in the subtle notions associated with the all-pervading principle of *mana*—a kind of supernatural force or virtue analogous to the Augustinian *grace*. Yet all are, or till recently were, inveterate cannibals, like so many of the New Guinea Papuans, and of the populations in the African cannibal zone. From this, however, it would be wrong to infer that anthropophagy is confined to the Negro peoples. It is known to have existed amongst the ancient Egyptians; it still prevails amongst some of the Hamitic Galla peoples, and several South American tribes—Botocondos, Catiôs, Cocomas, and other Amazonians—are undoubtedly cannibals. The Cocomas of the Marañon (Upper Amazon) formerly ate all their dead relations, grinding the very bones to drink in fermented liquors, and affirming that it was better to be inside a friend than devoured by worms in the cold earth.

THE MONGOLIC DIVISION.—This great section, which, before the relatively recent expansion of the Caucasian peoples, was the most numerous and widely-



1 Lapp (1 gro Finn type) 2 Ostyak Prince 3 Ostyak (carse type) 4 Volga Finn Type (Cheremisa woman) 5 Volga Finn T (Mordvinian woman) 6 Turki Type (Kiamil Fasha) 7 Kalmuck woman (full blood Mongolic type) 8 Chinese (refined type)



Esquimo type (Alaska) 2, 3. Vancouver Island Indians (N. W. Coast type) 4. Dakota Chief ("Standing Bear" type) 5. Prairie Indian type 6. Indian

distributed branch of mankind, takes its name from the Mongol-nomads of Central Asia, who are rightly regarded as typical members of the family. In the steppe region, occupied by them throughout the historic period, they appear to be intruders, the few skulls recovered from the old graves in Mongolia being all dolicho, whereas the true Mongol is round-headed. The cradle of the race must therefore be sought elsewhere, and a reasonable supposition is that it lay most probably on the Tibetan plateau. In early pleistocene times this vast table-land, with its southern Himalayan ramparts, was less elevated than at present, and might easily have been reached by primitive man from Indo-Malaysia. Tibet is also one of the chief areas of specialization for mammals, as shown by such distinct forms as the yak, the Tibetan bear, argoli, kiang, antelope, and several rodents, so that 'no equally peculiar mammalian fauna is to be found in any continental area of equal extent' (Blandford). It would also appear that the isolation and development of this most peculiar fauna is intimately connected with the date of elevation of the Himalaya, and of the Tibetan plateau, where a great part of the upward movement may have been post-pliocene (Lydekker). Here, therefore, the Mongolic variety of the highest mammal may very well have been specialized, and in later (neolithic) times have radiated from this lofty citadel in all directions over the Asiatic and Malaysian lands. Thus was a large part of the northern hemisphere flooded with the Mongol type of man, which became diversely modified as it wandered farther and farther from its primeval home into new environments—Siberia, Indo-China, Oceania, and the Aralo-Caspian basin. Whether the Mongols ranged westwards to Central Europe before they overran a great part of that region in the historic period, has been much discussed, and the 'Finnish theory', that paleolithic man was a Finn or Western Mongol, who withdrew with the reindeer to his present northern homes with the retreat of the ice-cap, was at one time regarded with favour. Learned works were written to prove that the Cave-men were 'Uralians', and the Basque language still surviving in the Pyrenees an Ural-Altaic form of speech. Now the whole theory is discredited, since it has been shown that Basque is a fundamentally distinct tongue, remotely connected, not with Ural-Altaic, but possibly with North African (Hamitic); that the Cave and River-drift men were all long-heads, whereas the Mongols are round-headed; and that the Finns themselves are quite recent arrivals in north-east Europe, or, at least, in the Baltic lands. Before the dawn of history both sides of the Gulf of Finland still formed part of the Germanic domain, and were not occupied by Finnish tribes from the east till the withdrawal of the Goths west and south about the fourth or fifth century of the new era.

Like the Bantus, the northern Mongol peoples possess linguistic unity; and an immense number of languages, all traceable to a postulated Mongolo-Turki mother tongue, range with little interruption from Hungary and Lapland across the northern hemisphere to East Siberia, Corea, and Japan. The divergences are generally great, and in some instances enormous, so that some of the outer links—Magyar, Samoyad, Corean, Japanese—hang loosely with the body of this long-drawn-out linguistic chain. But all are typical agglutinating tongues of the postfix order, with unchangeable roots followed by an indefinite number of changeable suffixes, the whole bound together by the principle of vocalic harmony.

Ethnically the Mongol division falls into three great sub-groups—*Northern, Southern, and Oceanic*

Mongols—where the different geographical areas correspond largely with different physical and mental characters. For details see *MONGOLS, FINNS, MAGYARS, MALAYS, CHINA, &c.*

THE AMERICAN DIVISION.—Reference has already been made to a general uniformity, amid much diversity, in the physical and mental characters of the American aborigines. Some of the diversities, those especially which are correlated with the shape of the head, seem inexplicable, except on the assumption of a twofold origin of the race. In early pleistocene times the land connections were still perhaps largely available for the passage of migrating hordes both from Western Europe through Iceland to Greenland, and eastwards across the Behring waters (see above). By the former route may therefore have come the long-headed paleolithic man, who is now supposed by many authorities to be represented by the long-headed Eskimo, if not also by the Bobocudos and other long-heads of like type in the southern continent. By the Asiatic route came, perhaps somewhat later (in neolithic times), the Mongoloid round-heads, who still form the majority, and on the whole the more cultured section, of the native populations. In any case the intermingling of these two streams will best account for the present conditions, and it is difficult to see what other theory can be suggested apart from the impossible assumption of an independent evolution of the American aborigines.

From the East, therefore, came the people, and according to some distinguished archaeologists from the East also came their culture. There are upright monoliths, they argue, in Britain (Stonehenge), and uprights in South America (Tiahuanaco); pyramids in Memphis and pyramids in Mexico; Buddhist views of an after-life in the Old and in the New World; similar calendric systems in Central Asia, and in Mexico and Yucatan. But when these grounds of comparison are subjected to careful analysis they fall to pieces, while the arguments in support of an independent evolution of American culture after the Stone Ages appear to be unanswerable. It is obvious that the civilized peoples of America cannot have come from all parts of the eastern hemisphere. If they were Britons and built Tiahuanaco, they were not Egyptians; if they were Egyptians and built the pyramids of Cholula and Uxmal, they were not Buddhists; and so on. A selection has therefore to be made, and it lies outside the range of possibility to select any one or two peoples of the Old World who will explain the cultural conditions of the New. The languages, to begin with, being radically distinct, root and branch, present an impassable gulf. Not a vestige of any Old World form of speech has ever been discovered (though many have been imagined) in any part of America. The Tiahuanaco uprights could not have been erected by the Britons, because they are highly-polished and well-mortised blocks forming part of a stupendous monument never completed, but immeasurably beyond the mechanical skill and architectural genius of our rude British forefathers. The American pyramids could not have been built by the Egyptians, because the oldest date only from about the sixth century of the new era, 2000 or 8000 years after the people of the Nile valley had ceased to raise such structures. Moreover, the types differ, the Egyptian all terminating in an apex, whereas the American are all truncated and terraced, with a temple on the platform approached by flights of steps. They were *teocallis*, 'God's House', temple, and monument in one, whereas their pretended prototypes were monuments only, 'petrified mounds', as they have been called. The Buddhist religious ideas

are mere coincidences, such as occur almost everywhere, and can prove nothing. No Buddhist missionaries could have influenced Aztec thought without also influencing Aztec speech and Aztec arts and industries, and of such influences there are no traces. Lastly, the calendric systems are totally different, the Maya and Aztec year of 18 months of 20 days each, with 5 supplemental days, and also with phonetic day-characters explicable only in the Maya and Aztec languages, having no counterpart in Central Asia or anywhere else.

It is further to be considered that American culture shows an orderly evolution almost from the shell-mounds of primitive man through the earth-mounds of the prairie Indians, and the *casas grandes* of the Pueblos to the great monuments—teocalli, palaces, irrigation-works, with all the associated industrial arts—ranging from Mexico through Guatemala and Yucatan to Peru and Bolivia. But the assumption is that cultured peoples from the Old World did all these things. Where, then, are the arts, and appliances, and material resources of these cultured peoples? Where the seaworthy ships with which they must have crossed the oceans to reach the New World, where navigation was in a rudimentary state—dug-outs, rafts, paddles, scarcely a sail or a rudder—in pre-Columbian times? Where such common domestic articles as lamps, which were absolutely unknown except amongst the Eskimo, who may have borrowed them from the Greenland Norsemen? Where the silk, the tea, the rice, wheat, domestic animals—ox, horse, pig, sheep, goat, poultry—the alphabetical and syllabic writing systems, the Babylonian cuneiforms, the Chinese and Egyptian hieroglyphs, and the thousand other products and inventions of the eastern civilized nations? All these things could not possibly have been left behind; and the irrefragable conclusion is that no advanced cultured peoples ever reached America before the Norse and Spanish navigators, and consequently that the local cultures are local growths developed since the Stone Ages independently of all extraneous influences. (See also AMERICAN ANTIQUITIES.)

THE CAUCASIO DIVISION.—Amongst the large African animals—hippopotamus, giraffe, elephant, lion, ostrich—whose prototypes are traced to the extinct fauna of the Siwalik hills flanking the Himalayas, were included some man-like apes (*Simidsa*), and especially a chimpanzee (*Anthropopithecus*), with a more human type of dentition than the living Ethiopian species. The land routes followed by these animals from India to Eurafica were also accessible to that chimpanzee's distant relation, early pleistocene man. These land connections, whether running north of the Persian Gulf to Asia Minor, or more to the south across the Straits of Oman and Bab-el-Mandeb, are now accepted by all palaeontologists, who point out that 'they must have been of considerable width, and suited to the passage of mammals of all kinds' (Lydekker). There is thus no difficulty at all in bringing the generalized Indo-Malaysian pleistocene man into North-east Africa, and thence to the Sahara. At that time this wilderness was neither a marine basin, as was formerly supposed, nor a waste of sands and shingle, as it now largely is, but, on the contrary, one of the most favoured regions on the globe, abounding in animal and vegetable life, and traversed by running waters, whose now dry beds may still be traced for hundreds of miles in all directions. (See SAHARA.) Here, therefore, primitive man, who in glacial times followed the large African fauna into Europe (see above), may have gradually become specialized, assuming those distinctive Caucasian characters which became di-

versely modified by interminglings in new environments, as he wandered from his Saharan cradle to fresh habitations in Europe and Western Asia.

We thus get for the Caucasio division a probable area of origin and dispersal, which, as a working hypothesis, will be found to harmonize better with the actual relations than any other hitherto proposed. Even the two cranial types—round and long heads—are here found ranging over wide spaces from remote prehistoric times. There are, as in Europe, even two long-headed types, one like those of Spy and Neanderthal, occurring in Algeria and Tunisia, and in stations abounding in palaeoliths, the other like that of the later Cro-Magnon dolmen-builders, identified with the North African dolmen-builders, and with the present blue-eyed Berbers of Mauritania and the Saharan uplands. The round-heads, ranging from Tunisia to the Canary Islands (here extinct), probably represent the Libyans (Tamahu) of the Egyptian records, and still strongly resemble the brown round-heads of France and the Alps. Sergi, who has subjected skulls from all parts of North Africa and Europe to an exhaustive analysis, concludes that North Africa is the cradle whence the primitive Caucasian peoples 'spread northwards to Europe, where they still persist, especially in the Mediterranean and its three principal peninsulas, and eastwards to Western Asia', that is, to the whole of the prehistoric domain of the white man.

In Europe all three types are found throughout the historic period disposed side by side in three great geographical zones. In the north, but formerly ranging as far south as the river Main, are the tall, blue-eyed, fair-headed, long-heads of florid complexion, usually regarded as typical Teutons—Linné's *Homo europæus*. In the extreme south, along the shores of the Mediterranean and in the islands, are the short, black-eyed, black-haired, long-heads of dark or somewhat olive complexion, typical south Europeans—*Homo mediterraneus*. Between these two are the middle-sized, brown or hazel-eyed, chestnut or brown-haired round-heads of light or pale complexion, stretching through France and the Alpine lands into the eastern plains—French, Swiss, Tyrolese, Slavs—by some, for want of a better name, called *Homo alpinus*. Owing to secular migrations and interminglings, endless transitional shades of all the correlated parts occur along the borderlands of the three zones, which have now also been roughly traced through Russia, Asia Minor, and Arabia eastwards to Armenia, the Caucasus, Irania, the Hindu-Kush, and northern India. Thus the Arabs are normally undersized, swarthy long-heads, like *Homo mediterraneus*, while the Armenian Highlanders, like the Swiss and Tyrolese, are middle-sized, brown round-heads, whose skulls present the most striking analogies with those of the brachy Berbers and Canary Islanders, of the French Auvergnats and Savoyards, and with those of the Hindu-Kush Galchias.

In the Mediterranean lands Sergi has shown that the original substratum—Iberians in Spain, *Ligurians* in Italy, and *Pelasgians* in Greece—were all typical long-heads, as for the most part their modern representatives still are. The *Ligurians*, commonly supposed by English and French anthropologists to have been of the brachy Keltic type, are shown to have been undoubtedly long-headed. Of about sixty crania taken from their prehistoric graves in north Italy, every one was found to be pronouncedly dolicho. With the *Pelasgians* we touch on a thorny question which has been discussed for over 2000 years, but has been recently somewhat elucidated by the archaeological investigations of Mr. A. J.



1 Englishman (refined type) 2 Englishman (coarser type) 3 Primitive Irish type 4 Scandinavian (refined type)
 5 Scandinavian (coarser type) 6 German type 7 Frenchman (Alpine type) 8 Magyar 9 Spaniard 10 Arab
 11 Afghan (Hittite type) 12 Hittite (Mediterranean) type 13 Polynesian (Chatham Islands) 14 Polynesian

Evans and others in the Aegean lands. Here are now established two cultural ages—*Pre-Mycenaean* and *Mycenaean*—both associated, not with the later Hellenic intruders, but with the Pelasgic aborigines of Greece, Asia Minor, and the Archipelago. Hence for the first rude Hellenic immigrants the cultured Pelasgians were a god-like race ('divine' in Homer). But after many centuries such Pelasgians as had lagged behind in the onward march of civilization were rude barbarians of non-Hellenic speech (Herodotus); while still later, when all had disappeared by absorption in the Hellenic world, their origins were forgotten and all were Greeks (Dionysius). Thus may be reconciled the contradictory statements of the Greeks themselves regarding their cultured Pelasgic precursors.

Although these groupings of the primitive and later Caucasian peoples are based, not on linguistic, but on physical and archeological grounds, it is none the less a fact that, apart from the Basques and natives of the Caucasus, all are either of Hamito-Semitic or of Aryan speech. About the fundamental unity of the Hamitic and Semitic families, which extend uninterruptedly from the Atlantic to Mesopotamia, there is no longer any reasonable doubt. That the divergence is so great as to obscure their common origin is not surprising when we remember that already some 6000 or 8000 years ago both had been highly specialized, as may be seen by comparing the early Egyptian (Hamitic) and Assyrian (Semitic) documents. With these may now be associated the still more archaic form of Semitic speech recovered from the numerous rock inscriptions of Arabia Felix (Yemen), which contain records of the ancient Sabeans and Minaean empires. On the other hand, Semitic shows no kind of affinity with the Sumero-Akkadian, which had preceded it in Babylonia, and is regarded by many as a member of the Mongolo-Turki family. See ASSYRIA.

Confronting the Hamito-Semitic in the south is the great Aryan linguistic family, which in the north stretches from India to Iceland, and in recent times has ranged over the New World, South Africa, and Australasia. Here is not the place to discuss the many difficult questions arising out of this astonishing diffusion in remote times of a single form of speech over a great part of the northern hemisphere, inhabited by a multiplicity of peoples who have little in common beyond their descent from a common pleistocene prototype. It will suffice to point out that the full significance of the fact seems scarcely to be grasped by those philologists and ethnologists, such as Max Müller and Schrader, who approach the subject each from his own standpoint. When it is argued that the Aryans came from the east or from the west, from Irania or Lithuania, from the Baltic or the Black Sea, for all these views have been advanced, it is obvious that the fundamental conditions of the problem are misunderstood. When we are told, for instance, that the 'Aryans' entered Europe from Irania, or Asia from the Baltic, in successive streams of migration—Keltic, Teutonic, Italic, Slavic, and so on—it is forgotten that the peoples so named differ greatly in their physical characters, and consequently could not have all been of one Aryan stock, or have poured forth from the same cradle-land. If the Aryan prototype was a long-headed, with blue eyes and red or brown hair, like the proto-Teuton, he could not have at the same time been an undersized round-head, with a yellowish hair, like the proto-Kelt. But these are the two main types, both of Aryan speech, which have conquered Europe; if they came from the same land before the dawn of history, and

as they could not both be 'Aryans', we have here only one, not two, waves of Aryan migration; and so with all the others. The first point, therefore, to settle, is the physical type of the proto-Aryan race, and until that is done, it is useless to discuss 'Aryan migrations'. In truth, the diffusion was linguistic, not racial, or racial only to an infinitesimal extent, and this linguistic diffusion must have already begun over a considerable area before any great migrations can be spoken of. Then everything will right itself, and we shall have migrations not of nondescript or impossible 'Aryans', but of diverse peoples—long-heads, round-heads, and so forth—of Aryan speech, and from different, though possibly contiguous ethnical regions, consequently also arriving not in successive waves along the same channel, but by different routes and at different times. In this way it will be easy to understand how hordes of Teutonic type and Aryan speech may have reached the Baltic lands by a northern route from the Aralo-Caspian steppe, or from the northern shores of the Euxine; while hordes of Celtic type and Aryan speech may have moved by a southern route from Asia Minor through the Balkan Peninsula and up the Danube, to Bohemia, Helvetia, Gaul, and Britain. But even then there must have been interminglings and further modifications of physical characters; because the regions traversed by such hordes, arriving perhaps mostly as conquerors, were not a *tabula rasa*. Central or western Europe had already been occupied by primitive man, and in large numbers by his Neolithic successors, whose stations, some of vast extent, occur everywhere on dry land, in shallow lacustrine waters, and round the northern and western sea-board. The modifications are plainly seen in the British Isles, where the cephalic index, which ought to be low (about 72), has been raised by the intruding round-headed Kelts to about 78, and this average prevails everywhere with surprising uniformity, never exceeding 79, or falling below 76, in Great Britain or Ireland.

The primary divisions and chief sub-groups of mankind may be given as follows:—

I. ETHIOPIC (BLACK OR NEGRO) DIVISION.

1. AFRICAN (WESTERN) SECTION.

Primeval Home.—Africa south of the Sahara. **Later Expansion**—United States, Central and South America, West Indies, Madagascar.

Population.—Africa, 150,000,000(?); Madagascar, 8,000,000; America, 20,000,000; total, 178,000,000.

Antennae.—*Antennae* 10-segmented; *maxillae* long; *saw*, pro-nathous; *nose*, broad at base, flat; *lip*, thick; *upper*, acute-bicus; *rather* prominent; *brown*, arched; *eye*, large, round, black; *yellowish* sclerotic, *foot*, flat, with larkspur heel; *arms*, disproportionately long; *colours*, undeveloped; *colour*, very deep brown and blackish, rarely quite black; *hair*, short, black, woolly, flat in cross section, sparse or no beard; *height*, above the average, 5 ft. 8 in. to 6 ft.

Mental Characters.—*Temperament*: Sensual, unintellectual, fitful, passing readily from comedy to tragedy; mind arrested at puberty, hence unprogressive; no science or letters; few arts beyond agriculture, weaving, pottery, woodwork, and metallurgy (iron and copper). *Religion*: Nature and ancestor worship, fetishism, witchcraft, human sacrifices, oracles. *Speech*: Agglutinative, with prefixes and postfixes; numerous stock languages in Sudan; one only in Bantaland, besides Hottentot and Bushman; and in Madagascar, Malayo-Polynesian.

[illegible]

Aberrent and Doubtful Groups.—*Fulas*, West and Central Sudan; speech, Negro; type, Negroid. *Fans*, Ogway and Gabun basins; speech, Bantu; type, Negroid. *Wasandawa*, east side Lake Victoria; speech, Hottentot; type, Bantu. *NEGROIDS*—*Akka*, *Wookwa*, *Obongo*, *Batwa*, *Valpene*, Ogway and Congo Forests, Transvaal. *BUSHMEN*—Originally everywhere south of Lake Tanganyika, now south of the Zambesi (Bochuanaland, Kalahari Desert). *HOTTENTOTS*—Originally everywhere south of the Zambesi, now chiefly in Namaqualand and parts of Cape Colony.

2. AUSTRALASIAN (OCEANIC OR EASTERN) SECTION.

Primeval Home.—Malaysia, Andamans, Philippines, New Guinea, Melanesia, Australia, Tasmania. **Present Domain.**—Malaysia east of Flores, Andamans, Malay Peninsula, parts of Philippines and Australia, Melanesia.

Population.—2,000,000, chiefly in New Guinea and Melanesia.

Physical Characters.—*Head*, long and (in Negritos) round; *jaw*, extremely prognathous in Negrito and Australian, moderately in Papuan and Tasmanian; *nose* of Papuan large, straight or arched, with downward tip, of others small, broad, with wide nostrils; *hair*, frizzly and (Australian) shaggy; other Negro features softened.

Mental Characters.—Boisterous, cruel, treacherous, indolent, generally more savage than African; head-hunting common in Melanesia; cannibalism formerly prevalent everywhere except amongst Negritos; no science, letters, or arts, except agriculture, pottery, weaving, and woodwork; artistic sense somewhat developed in Papuans. **Religion:** Nature and spirit worship, tabu. **Speech:** Archaic forms of Malayo-Polynesian in Melanesia; agglutinative, with postfixes, in Australia and most of New Guinea; with pre- and postfixes in Andamans.

Sub-Groups.—**PAPUASIANS**, including PAPUANS proper of East Malaysia and New Guinea, and MELANESIANS of Admiralty, New Britain, Louisiades, Solomons, New Hebrides, New Caledonia, Loyalty, and Fijii. **AUSTRALIANS**, in the unsettled parts of Australia and in reserves. **NEGROIDS (NEGROITS)**—*Andamanese*; *Sakais*, *Samangs*, and others of the Malay Peninsula; *Aetas*, scattered in small groups over the Philippine Archipelago.

II. MONGOLIC (YELLOW) DIVISION.

Primeval Home.—The Tibetan Table-land. **First Migrations.**—Indo-China, China, Mongolia, Siberia, Malaysia, America. **Later Migrations.**—Corea, Japan, Formosa, Turkistan, Irania, Asia Minor, Caucasus, Russia, Baltic Lands, Balkan Peninsula, Hungary, Madagascar.

Population.—China, 330,000,000; Indo-China, 35,000,000; Japan and Corea, 55,000,000; Malaysia, 30,000,000; Mongolia and Manchuria, 10,000,000; Tibet, 6,000,000; Turkistan and Siberia, 7,000,000; West Asia, 13,000,000; sundries, 6,000,000,000; total, 540,000,000.

Physical Characters.—*Head*, round; *jaw*, slightly prognathous; *nose*, small and concave; thin lips, prominent cheek-bone, small, slant, black eyes; *colour*, normally yellowish, or yellowish-brown, pale or whitish in Manchuria, Corea, Turkistan, Baltic Lands, Asia Minor; *hair*, long, coarse, and black, round in cross section; beard scant or absent, moustache common; *stature*, rather undersized, 5 ft. to 5 ft. 6 in.

Mental Characters.—**Temperament**, reserved, sullen, apathetic, thrifty, and industrious in China and Japan; elsewhere mostly indolent; nearly all reckless gamblers; science slightly, arts and letters moderately developed.

Religion.—All true Mongols, Chinese, Tibetans, and Indo-Chinese, nominal Buddhists; all Turki groups, Mohammedans; Finns, Lapps, Magyars, Christians; Siberians, mostly Shamanists and Pagans; Malays, Mohammedans and Pagans; spirit worship very general.

Speech.—Three great families. 1. *Ural-Altaic (Mongolo-Turki)*, Lapland to Japan, Hungary to Turkistan; agglutinating, with postfixes and vowel harmony. 2. *Tibeto-Indo-Chinese*, Tibet to the Pacific, Great Wall to Indian Ocean; originally agglutinating, now in every transition of phonetic decay towards monosyllabism, with numerous homophones distinguished by tone, hence may be called monosyllabic-toned languages. 3. *Malayo-Polynesian*, the Oceanic linguistic family in a pre-eminent sense, from Madagascar across the Indian and Pacific Oceans to Easter Island, and from Hawaii to New Zealand; all agglutinating, at various stages of dissolution, but untuned.

Sub-Groups.—**MONGOLO-TURKS**—*Mongols* proper; *Khalas* or *Shars*, i.e. *Eastern Mongols*; *Kalmuks* or *Western Mongols*; *Burials*, of Central Siberia; *Turkians*, *Manchus*, *Shiyaks*, of East Siberia and Amur basin. **TURKI branch.**—*Fakuts*, of Lena basin; *Kirghis*, *Usbeks*, *Turkomans*, of West Siberia and Central Asia; *Nogais*, *Tats*, *Anatolian Turks*, *Omanis*, of Caucasus, East Russia, Asia Minor, and Rumelia. **UGRO-FINNIC branch.**—*Eastern Finns*: *Soyots*, *Ortyaks*, *Voguls*, *Syrjaniens*, *Perwians*, Altai, Siberia, Ural, and East Russia. *Volga Finns*: *Mordvins* and *Cheremesses*, Middle Volga. *Western Finns*: *Fepes*,

Finns proper, *Liconians*, *Bulgars*, *Magyars*, Baltic Lands, Hungary, Lower Danube. **Northern Finns:** *Lapps* and *Samojeds*, Lapland, North Russia, North-west Siberia. **TIBETO-CHINESE**—*Tibetans*, *Burmese*, *Shans* (*Siamese*, *Ahoms*, *Khamtis*), *China*, *Nagas*, *Muhmis*, *Annamese*, *Chinese*, Tibet, Himalayan slopes, most of Indo-China and China. **MALAYANS**—*Malays proper*, *Sundanese*, *Javanese*, *Batinese*, *Sasaks*, *Bugis*, *Biajans*, *Tagals*, *Formosans*, *Hovas*, *Malays*, *Philippines*, *Formosa*, *Madagascar* **COREO JAPANESE**—*Coreans*, *Japanese*, *Liu-Kiu Islanders*. **SUB-ARCTIC**—*Chukchi*, *Koryaks*, *Kamchadals*.

Note.—Many of the Western Mongolic peoples—Turks, Finns proper, Magyars, Bulgars, and others—are now assimilated in most of their physical characters to the Caucasian type. They are the 'allophylians' of some writers.

III. THE AMERICAN DIVISION.

Primeval Home.—The New World. **Present Domain.**—The unsettled parts and some reserves in the Dominion; Alaska, numerous reserves and some western tracts in the United States; Mexico, Central and South America, partly intermingled with the white and black intruders; here and there still in the tribal state.

Population (pure and mixed).—Full-blood, 9,000,000; half-breeds, 12,270,000, total, 22,170,000, chiefly in Mexico (3,785,000), Brazil (4,200,000), Colombia, Peru, Bolivia, Guatemala, and Venezuela; in the United States, only 250,000; and Canada, 100,000. West India, scarcely any.

Physical Characters.—*Head*, very variable, round and long, with all degrees of mesocephaly; *jaw*, massive and slightly prognathous; *nose*, large, straight or aquiline, generally leptorrhine, but often meso or platyrrhine; *eyes*, small, straight, and black; *cheek bones*, low or moderately prominent; *features*, fairly regular, often of almost Caucasian type, but Eskimo and some others broad, round, and flat, Mongoloid; *colour*, coppery-red, shading off to yellowish or yellowish-brown, and even dark-brown; *hair*, very long, coarse, lank, and black, scant or no beard; *stature*, variable, highlanders generally undersized, 5 ft. to 5 ft. 6 in. Prairie Indians, tall, 6 ft. 10 in. to 6 ft. 7 in. Patagonians and Bororos, very tall, 6 ft. to 6 ft. 4 and even 6 ft.

Mental Characters.—**Temperament**, austere, moody, impassive, wary, taciturn, mostly in the tribal state; amongst the cultural peoples (Mayas, Aztecs, ~~Chichuas~~), science slightly, arts and letters moderately developed. **Religion:** Polytheistic, with human sacrifices where most developed, Aztecs, Mayas; elsewhere, nature worship and Shamanism. **Speech:** Almost universally of polysyllabic structure, with an immense number of irreducible stock-words, a few ranging over vast spaces on the open plains and plateaux, but mostly crowded together in astonishing numbers in some coast districts (British Columbia, Oregon, California), in Mexico, Central America, Colombia, and Amazonia.

Chief Sub-Groups.—**ATHAPASCAN OR FINNIC**—*Eskimos*, *Chippewoyans*, *Apaches*, *Nabajos*, Alaska to Hudson Bay, with isolated groups on west coast and about United States and Mexican frontiers. **SHOSHONEAN (Snake)**—*Bannocks*, *Comanches*, *Utes*, *Moguts*, Oregon to Texas, Idaho to South California and Arizona. **SIOUAN**—*Dakotas*, *Assinibons*, *Omahas*, *Crows*, *Iowas*, *Manouri*, *Blozi*, and *Catawbas* (extinct), Hudson Bay to Arkansas, Virginia, Carolina, and Gulf of Mexico. **ALGONQUIAN**—*Delawares*, *Crees*, *Ojibwas*, *Shawnees*, *Arapahoes*, *Sacs* and *Foxes*, *Blackfeet*, and many others, Rocky Mts. to Newfoundland, Labrador to Kentucky and Virginia. **IROQUOIAN**—*Hurons*, *Eries*, *Mohawks*, *Senecas*, *Cnyugas*, *Onondagas*, *Oneidas*, *Tuscaroras*, *Cherokees*, Laurentian basin, New York, Pennsylvania, Michigan, Carolinas. **MUSKOGEEAN (CREEK)**—*Creeks*, *Choctaws*, *Seminoles*, *Chicasaws*, Kentucky, Georgia, Florida, Alabama. **HUAXTEOAN**—*Huastecs*, *Mayas*, *Quichés*, *Poomams*, *Lacandons*, *Tamalulips*, Vera Cruz, Guatemala, Chiapas, Tabasco, Yucatan. **NAHUATLAN**—*Aztecs*, *Pipils*. **GUATEMALAN**, Mexico, Guatemala, Salvador, Nicaragua. **GUARANIAN**, *Guaymas*, *Pirabas*, *Taukums*, *Chichas*, *Yagui*, *Yuma*, *Tubor*, North and West Mexico from Sonora to Zacatecas. **TARASCAN**, OTOMI, ZOQUE, MIXE, HUAVE, MIXTECO-ZAPOTEC, South Mexico. **LENCAN**—*Tuca*, *Wulwa*, *Rama*, *Carca*, *Paya*, *Guatuso*, *Melchiora*, *Nicaragua*, Honduras, Costa Rica. **TALAMANCAN**, CUNA, Costa Rica, Panama. **CHIBCHA (MUSCO)**, CHOCO, PAREZE, Colombia. **COOINUO**, QUITA, Colombia, Ecuador. **CHINOHASUTU**, Ecuador, Peru. **YUNCA**, CHANGO, HUANGA, ANTISUTU, Peru. **QUICHUA**, AYMAR, Peru, Bolivia. **JIVARO**, ZAPARO, BEXOTO, PANO, TIQUANA, JURE, TACANA, Napo, Ucayali, Putumayo, and other head-waters of the Amazon River. **PURUS**, MOJOS, CARABUYARAS, Purús, Japura, Beni, and Mamore rivers. **ARAWAK**, The Guianas, and thence southwards to the Amazon—Paraná waterparting. **CARIB**, Central Brazil northwards to Guianas, Venezuela, and West India. **TUPI-GUARANI**, Amazonia, East Brazil, Paraguay. **TAPUYA (GEB)**, East Brazil. **BORORO**, Mato Grosso. **GUYANA**, MATAO, TORA, ARIPONIA, LULU, Gran Chaco. **ARAUCAN**, Chili. **PURICHEN** (Pampas). **TAMUICHE** (Patagonians), South Argentina, Patagonia. **YAGANE** and **ARAUCAN**, Fuegia.

IV. CAUCASIAN (WHITE) DIVISION.

Primal Home.—Africa north of Sudan. Early *Expansion*.—All the Mediterranean lands, North-east Africa, Arabia, Central and West Europe, Britain, Southern Asia, Central and East Asia, Japan, Malaysia, Polynesia. **Present Expansion.**—Nearly the whole of Europe, South Africa, North Africa, America, Australia, Tasmania, New Zealand.

Population.—Europe, 355,000,000; Asia, 230,000,000; America, 115,000,000; Africa, 15,000,000; Australasia, 5,000,000; total, 770,000,000.

Physical Characters.—Three types. 1. *Homo europæus*.—Head, long; nose, large and straight; eyes, blue or gray; colour, florid; hair, rather long, wavy, flaxen, light-brown, and red, full beard; stature, tall, 5 ft. 8 in. to 6 ft. 2. *Homo mediterraneus*.—Head, long; nose, large, straight, and aquiline; eyes, black; colour, pale, olive, and swarthy; hair, black, wavy or curly (wiry), full beard; stature, low, 5 ft. 2 in. to 5 ft. 6 in. 3. *Homo alpinus*.—Head, round; nose, moderately large, straight, narrow; eyes, brown, gray, or hazel; colour, pale-white; hair, light brown or chestnut, rather short and straight, with small beard; stature, medium, 5 ft. 6 or 7 in.

Mental Characters.—Temperament of 1 solid and somewhat stolid, cool, collected, resolute, and tenacious; of 2 and 3 fiery, fickle, bright, impulsive, but unsteady, with more love of show than sense of duty; also rather indolent (3); all three highly imaginative and intellectual, hence science, arts, and letters everywhere fully developed. **Religion:** Monotheistic (Judaism, Christianity, Mohammedanism), but also polytheistic (Brahmanism, &c.) in India and elsewhere. **Speech:** mainly inflecting, but agglutinating in the Caucasus, the Dookan (Dravidian), and Polynesia. Two great linguistic families; *Hamito-Semitic*, North Africa, South-west Asia; *Aryan* (Indo-European, Indo-Germanic), most of Europe, Armenia, Iran, Northern India, most of America, Australia, Tasmania, New Zealand, parts of North and South Africa.

Chief Sub-groups.—SOUTH MEDITERRANEAN: HAMITES—*Berbers, Turcoes, Egyptians, Bejas, Afars, Agaus, Gallas, Somah, Tibus, Masas, Wahuna*, nearly the whole of Africa north and east of Sudan. SEMITES—*Arabs, Abyssinians, Syrians, Chaldeans*, Arabia, North Africa, Abyssinia, Syria, Mesopotamia; *Amorites, Phœnicians, and Assyrians* (extinct), *Jews* (dispersed). NORTH MEDITERRANEAN: KELTS—*Irish, Basques, Spaniards, Portuguese, Catalans*. LIGURIANS—*Most Italians, Sards, Corsicans, Sicilians*. PELAGIO-HELLENIC—*Greeks, Albanians, Greeks*. ALPINE—*French, Swiss, Tyrolese, South Germans, most Slavs, Armenians, Kurds, Tajiks* (East Iranians), *Galchas, Sak-Pash, Kafirs*, *castes of Caucasus*. NORTH EUROPEAN: TEUTONIC, ROMAN EUROPEAN—*Most Scandinavians, Frisians, North Germans, Hollanders, Flemings, English, Scotch, Welsh, Irish* (modified).

Mixed, Aberrant, and Doubtful.—*Dards, Balti, and Ladakhi*, of Kashmir; *Hindus* of North India; *Dravidians* and *Kols* of Central and South India; *Todas* and *Veddahs* of Nilgiri Hills and Ceylon. *Anus* of North Japan and Kurile Islands; *Polynesians* of New Zealand (*Maori*), *Tonga, Tahiti, Samoa, and Hawaii*.

Population of the Four Primary Divisions.—CAUCASIANS, 770,000,000; MONGOLS, 540,000,000; NEGROES, 175,000,000; AMERIANS, 23,000,000; total, 1,537,000,000.

Bibliography.—Friedhard, J. C. *Researches into the Physical History of Mankind*, 1836, On the Relations of Ethnology to Other Branches of Knowledge, 1847. Latham, R. G., *Natural History of the Varieties of Man*, 1850; *The Ethnology of Europe*, 1853; *Descriptive Ethnology*, 1859. Waitz, T., *Introduction to Anthropology*, Eng. Ed., 1863. Darwin, C., *The Descent of Man*, 1871. Huxley, T. H., *Man's Place in Nature* (Collected Essays). Quatrefages, A. de, *Classification des Races Humaines*, 1850-52. Peschel, O., *The Races of Man*, &c., 1874. Tyler, E. B., *Researches into the Early History of Mankind*, &c., 1885; *Anthropology*, 1881. Lubbock, Sir J. (see *Lead* Avelbury), *Prehistoric Times*, 1868. *The Origin of Civilization*, 1870. Ratzel, F., *History of Mankind*, 1890-99. Keane, A. H., *Ethnology*, 2nd Ed., 1897; *Man, Past and Present*, 1899. Deniker, J., *The Races of Man*, 1900. H. N. Hutchinson, *The Living Races of Mankind*, 1900.

ETHYL is the name given to the radicle C_2H_5 , which is contained in ordinary alcohol, and which forms a vast number of derivatives. It cannot, however, be isolated; for when the attempt is made it doubles and yields the substance C_4H_{10} , diethyl or butylic hydride. This compound can be prepared by a number of reactions, and it is also found occurring naturally in some kinds of petroleum. Diethyl is insoluble in water, but dissolves readily in alcohol. It is a colourless gas, which is liquefied by moderate cold and pressure, and which burns with a brilliant

flame. As to the compounds formed by the radicle ethyl they have been regarded in a variety of ways. Thus in its compounds with acids (ethylic ethers) it plays the part of a metal; in other compounds, such as those with nitrogen, it takes the place of hydrogen, while in its metallic compounds it seems to play the part of an acid. There is not at present, however, any single view which embraces all the functions of such radicles, or which can distinguish them from those of other chemical substances.

ÉTIENNE, or ESTIENNE, the name of several famous French printers, commonly used in the corresponding English form, *Stephens*. See STEPHENS.

ÉTIENNE, St., a town of France, capital of the department of Loire, on the Furens, a small tributary of the Loire (from which the town is about 6 miles distant), 32 miles s.w. of Lyons. It is not regularly built, but has several spacious streets, one of them intersecting it almost centrally, and lined with rows of trees; but, owing to the number of public works, the whole place has a dingy appearance. The principal buildings and establishments are the cathedral, an ancient Romanesque structure; the town-house, court-house, exchange, communal college, mining school, gallery of arts, library and museum. The town owes its prosperity to its situation in the centre of one of the most valuable mineral fields of France; and in addition to the extensive collieries, blast-furnaces, and other ironworks in the vicinity, has many important manufactures, including ribbons, and other silk fabrics, hardware, cutlery, and firearms. The silk manufacturers employ in their various branches about 28,000 workers. The hardware manufactures employ 70,000 workmen; in the various processes of iron and steel manufacture about 9500 workmen are employed. The collieries are very extensive, and employ in all about 16,000 men. Pop. in 1886, 117,875; in 1896, 186,030; in 1901, 146,671.

ETIOLATION, or blanching of plants, is a state produced by the absence of light, by which all green colour is excluded. It is effected artificially, as in the case of celery. The green colour of etiolated plants may be restored by exposure to light.

ETIVE, LOCH, an inlet of the sea on the west coast of Scotland, in the county of Argyll, district of Lorne, nearly 20 miles long, of very unequal breadth, but at the broadest part about $1\frac{1}{2}$ mile. The scenery of its shores is very beautiful, and at its upper end mountainous and very grand. About 3 miles from the sea, at Connel Ferry, where it is quite narrow, a ridge of low rocks crossing it causes a turbulent rapid, which at half-tide forms a sort of cataract—"the falls of Lora". After flowing through Glen Etive, the river Etive enters the upper end of the loch. Near its junction with the sea is the fine ruin of Dunstaffnage Castle.

ETNA. See *ÆTNA*.

ETOLIA. See *ÆTOLIA*.

ETON, a town of England, in the county of Buckingham, in a pleasant valley, on the left bank of the Thames, 22 miles west of London. It consists principally of one narrow street, which has of late years been much improved. An iron bridge across the Thames connects Eton with Windsor, from which it is only separated by the river. Eton derives its celebrity wholly from its college—one of the great English 'public schools'—founded by Henry VI. in 1440, under the name of the College of the Blessed Virgin Mary beside Windsor. The present collegiate edifice, a conspicuous and ornamental building, mainly perpendicular in style, was commenced in 1441, and the whole of the original structure completed about 1523. This pile contains, in two quadrangles, the chapel, the two

schools, upper and lower; the headmaster's house, the provost's lodge, the residence of the vice-provost, and the library. Important additions to the buildings were made in 1846 and in 1889. Outside the college buildings proper there are school-rooms, laboratories, museum, &c. By the Public Schools Act of 1868 the number of scholars on the foundation is fixed (as before) at 70, said scholars being educated, lodged, and boarded in the college. The scholarships are open to all British subjects; candidates must be over 12, and not over 14 years of age, and pass an examination. The scholars not on the foundation, known as *oppidans*, numbering now over 900, are boarded and lodged in the houses of the masters; they are admitted between the ages of 10 and 14. There are various foundation scholarships at Cambridge and Oxford, and also some exhibitions. At present the income is between £20,000 and £30,000 a year. The course of instruction is essentially classical, but of late years the study of French, German, Italian, mathematics, science, and other branches of education, have been introduced. Many famous men have received their early education at Eton. Pop. in 1891, 2494; in 1901, 3293.

ETRURIA (Greek *Tyrrhenia*), the name anciently given to that part of Italy which corresponded nearly with the modern Tuscany, and was bounded w. by the Mediterranean, e. by the Apennines, n. by the river Magra, and s. by the Tiber. The name *Tuscia*, for the country, came into use in late times, while *Tusci*, as well as *Etrusci*, was used by the Romans as the appellation of the people from an early period. The country is covered by numerous chains of hills, partly offsets from the Apennines, partly independent ridges; and to these belongs the hilly and forest country in the south-east, known of old as the Ciminius Wood. Between the hills lie beautiful and fertile valleys, sometimes intersected by rivers, such as the Arno (ancient *Arnus*), sometimes containing lakes of volcanic origin, as Lake Trasimene (Trasimenus), near Perugia, and the *Lacus Vulsinensis* (near Bolsena). The oldest inhabitants of the country belonged, according to the accounts of the ancients, to the Umbrian stock, and were dispossessed by the Tyrrhenians or Tyrsenians, a people who came by sea, and who were generally believed to be Lydians. These again were in early times subjected by another race who called themselves *Rasena*, and who finally became incorporated with the Tyrrhenians proper, the whole nation then being called Tuscans or Etruscans. These *Rasena*, by ancient writers usually confounded with the Tyrrhenians, entered Italy at a very early period from the north (Rhetia), and, gradually pressing southward, took possession of the whole country from the Alps, Ticino, and lower Adige on the north till beyond Bologna (in Etruscan *Felsina*) on the south. From Northern Italy they were driven by the Gauls; but in Etruria they founded a state powerful both by sea and land, extending their influence, partly through conquest, partly through colonization, far beyond the limits of Etruria, as, for instance, to Campania and the islands of Elba and Corsica. To what race the Etruscans belonged is unknown, and our ignorance is equally great with regard to their language, remains of which still exist in numerous inscriptions mostly on tombs. It appears to have been quite distinct from the languages of the rest of Italy, but attempts to connect it with the Greek, Celtic, Germanic, or Semitic languages have had little or no success. The characters used are essentially the ancient Greek, and were either introduced from Magna Græcia or possibly from Corinth. Etruria was very early a confederation under the rulers of the twelve principal cities, each of which formed a re-

public by itself. They were: Pisa (*Pisa*), Pistoria (*Pistoja*), Florentia (*Florence*), Fæsulæ (*Fiesole*), Volaterræ (*Volterra*), Volsinii (*Bolsena*), Clusium (*Chiusi*), Arretium (*Arezzo*), Cortona, Perugia (*Perugia*), Falerii (*Falari*), and the rich city of Veii. The chiefs of these republics were styled *lucumones*, who were also the priests and generals, and held their meetings in the temple of Voltumna, where they deliberated together on the general affairs of the country. Porsenna, celebrated in Roman history, was a *lucumo*. In all the cities there appears to have been an aristocracy, towards which the mass of the common people stood in the relation of clients, though there would no doubt be a body of entirely free men resembling the plebeians at Rome. The religion of the Etruscans offers a subject of great difficulty, but it is at least certain that it had many points in common with the religious systems of the Sabines and Latins, while in some respects it shows evidences of an eastern origin. 'There are not wanting indications which would connect the religious mythology of Etruria with that of the northern nations of Europe. The name of *Asar*, which was the Etruscan appellation for the gods in general, at once recalls the *Asar* of the Scandinavians, and much of the gloomy worship of the infernal deities, which forms so prominent a part of the Etruscan religion, presents a strong similarity with the northern mythology.' Among the deities may be mentioned *Tina* or *Tinia*, corresponding to the Latin Jupiter, *Cupra*, corresponding to Juno, *Menerva* (Minerva), *Sethlans* (Vulcan), *Turms* (Mercury), *Apulu* or *Apulu* (Apollo), *Voltumna*, *Vertumnus*, &c.

In the time of the later kings Rome was closely connected with Etruria (see PORSENNA and TARQUINIUS); in 485 B.C., however, the Romans attacked Veii, and after a series of contests it was taken and destroyed by Camillus in 396 B.C. At this time the Etruscans had also to defend themselves against the Gauls. The power of the Etruscans was afterwards completely broken by the Romans, more particularly through the great defeats inflicted in 295 at Sentinum in Umbria, and in 283 at the Vadimonian Lake. By the year 264 Etruria was completely under the power of Rome. Its cities appear to have enjoyed a much superior position to the generality of the Italian towns that submitted to Rome; and Etruria long maintained its national existence, its inhabitants retaining their language, arts, religious rites, and national peculiarities.

The chief occupations of the Etruscans were agriculture and commerce both maritime and overland. Grain, wine, timber, cattle, and wool seem to have been the principal articles of trade. The staple food of the common people was pulse, but the upper classes were notorious for extravagance in their diet as well as in dress and in furniture. Their knowledge of the arts and sciences is said to have been derived mainly from Greece, and in a less degree from Egypt. The iron-mines of Ilva (Elba), as well as the copper-mines in the interior of Etruria itself, were worked at a very remote period, and the metallurgical skill shown by the Etruscans was obviously connected with their proficiency in the art of working in bronze, silver, gold, &c. Of Etruscan architecture our knowledge is limited. The so-called Tuscan order seems to be little else than a modification of the Doric. Of their temples there exist no traces; the theatres have been more fortunate, that at Fiesole showing how much in this form of construction they owed to the Greeks. The sepulchres, which were always subterranean, but frequently having superstructures of an architectural character surmounting them, present many varieties of construction, so that no particular style can be fixed upon as being peculiarly

national or characteristic. The internal walls of some of the tombs were decorated with paintings, some of very rude design and fantastic in colouring; others showing a much higher skill, but retaining a stiffness and formality of character akin to those of the early Greek style. The existing remains of Etruscan sculpture as confined to works carved out of stone and wood, though numerous, are mostly of little interest from the late period to which they belong. In this class we may especially mention the sarcophagi and urns found at Volterra, Perugia, and Chiusi, the fronts of which are covered with reliefs representing subjects from Greek mythology and tradition, while on the cover is the figure of the deceased personage. The urns were generally carved from soft sandstone or alabaster, and are in most cases of indifferent execution, unmistakably belonging to a declining period of art, though bearing decided evidence of Greek influence in the mode of treatment as well as in the choice of the subjects. For articles in terra cotta the Etruscans were especially celebrated. These were not restricted to small objects, but embraced statues and figures of large size, with which the exteriors and interiors of their temples were adorned. Closely related to this branch of art was the Etruscan pottery, in the manufacture of which they excelled; but the only extant productions of this class that can be said to be genuine are the red ware of Arretium and the black ware of Clusium ornamented with figures in relief, many of them of a grotesque and strongly marked Oriental character. On the other hand, numbers of the painted vases popularly known as Etruscan vases are undoubtedly productions of Greek workmen, the subjects, the style, and the inscriptions being all Greek. The skill of the Etruscans in works of bronze is attested by many ancient writers, and also by numerous extant specimens. The style of art characteristic of these works is stiff and archaic, having some resemblance to the early Greek, though some of the existing specimens exhibit more freedom of design and great beauty of execution. The bronze candelabra, of which many examples have been preserved, were eagerly sought after both in Greece and Rome. Another branch of art which seems to have been peculiar to this people, was that of the engraved bronze mirrors, a considerable number of which has been discovered, some quite recently. These mirrors were polished on one side, and have on the other an engraved design, taken in most cases from Greek legend or mythology. Although the subjects were borrowed from the Greeks, and although, as works of art, evidently founded on Greek models, there can be little doubt that the mirrors are of native Etruscan manufacture, the inscriptions occurring on them being usually in Etruscan characters. Nor were the Etruscans less skilful in working other metals. Their embossed gold cups were celebrated among the Greeks even in the palmy days of Hellenic art, and the beauty of their necklaces, ear-rings, bracelets, and other articles of jewelry is attested by many extant specimens. The precious stones most in use for finger-rings and necklaces were the carnelian and agate, cut either in the form of scarabs or of beads. See *Is. Taylor's Etruscan Researches* (London, 1874), *Müller's Die Etrusker* (Stuttgart, 1877), *Dennis's The Cities and Cemeteries of Etruria* (3rd edn., 1892), &c.

ETTLINGEN, a town of Germany, in the grand-duchy of Baden, on the Alb, and on the railway to Carlsruhe, from which it is 5 miles south. It is an ancient place, containing some Roman remains; is entered by three gates, and has an old castle with gardens, town-house, hospital, normal and other schools, manufactures of linen and cotton goods, starch, leather, paper, &c. Pop. (1895), 6897.

ETTRICK, a pastoral district and parish of Scotland, in the county of Selkirk, containing the source of the river Ettrick. Anciently the district was covered with wood, and though now denuded of trees, it is still called *Ettrick Forest*. The river begins at Capel Fell, near the Dumfries border, and joins the Tweed some 2 miles from Selkirk after a north-easterly course of about 32 miles. It provides excellent trout-fishing, which is mostly free. St. Mary's Loch is in this district, which was also celebrated as one of the hiding-places of the persecuted Covenanters.

ETTY, WILLIAM, an eminent painter, was born at York on 10th March, 1787. He served a seven years' apprenticeship with a printer at Hull. Through the kindness of an uncle he was enabled to gratify his desire of becoming an artist, and entered as a student at the Royal Academy in January, 1807. He subsequently became an indoor pupil for twelve months of Sir Thomas Lawrence. For many years his progress was very slow and discouraging, but he worked hard and perseveringly in endeavouring to improve himself, and in 1811 he had a picture hung in the Royal Academy and one in the British Institution. In 1816 he paid a visit to Italy, and derived considerable benefit from his study in that country. In 1820 he succeeded in attracting public attention by a small picture entitled *Pandora*, exhibited at the British Institution; and still more effectually by the *Coral Finders*, exhibited the same year at the Royal Academy. Another laurel was added to his growing reputation in the following year by his *Cleopatra* arriving in Cilicia. In 1822 he made another journey to Italy, returning in 1824, in which year his picture of *Pandora* crowned by the Seasons procured for him the honour of being elected an associate of the Royal Academy. In 1828 he was elected a full academician. His fame was now fairly established, and he took rank among British painters as the first colourist of his day. Among his notable pictures may be mentioned more especially his *Ulysses* and the *Sirens*, in the Royal Institution of Manchester; *Youth at the Prow and Pleasure at the Helm*, in the Vernon collection; and the *Judith* series (three), *Benaiah*, and the *Combat: Woman pleading for the Vanquished*, all in the National Gallery of Edinburgh. Etty's great aim, as he informs us in his *Autobiography*, was to impress some grand moral truth; patriotism, for example, being illustrated in *Judith*, valour in *Benaiah*, and the importance of resisting sensual pleasure in *Ulysses* and the *Sirens*. Through all his works his highly poetic and imaginative genius shines conspicuously forth. In colouring and the representation of the nude, or partially nude, human figure, particularly females, he displays an ability unequalled by any of the modern, and almost unsurpassed by any of the older painters. Though extremely susceptible of the tender passion, and almost constantly engaged in some 'affair of the heart', Etty never was married, his house being kept by his niece. His moral deportment was of the most unblemished order. With the exception of occasional visits, his life was entirely spent in the exercise of his profession in London till 1848, when he took up his abode in his native town of York. In the summer of 1848 an exhibition of his pictures, numbering about 130, took place in the rooms of the Society of Arts, in the Adelphi, London—the crowning triumph of his life. His health had been for some time falling, and on the 13th of November, 1849, he expired at York.

ETYMOLOGY (*Greek etymologia*, from *etymon*, the true literal sense of a word according to its origin, from *etymos*, true, and *logos*, discourse, account—literally a discourse on, or account of, the origin of words) is that branch of the philology of any

language which deals with the origin, structure, and history of the words composing it.

Many philologists believe that language has its origin in *onomatopœia*, that is, in an attempt to imitate and represent natural sounds by the voice, with the view of suggesting the objects or actions producing these sounds, or objects in some way related to them, or fancied to be so, as by resembling them in some prominent quality. Others attribute considerable influence to the interjectional element along with the imitative, that is, to the instinctive utterance of certain sounds as expressive of certain feelings. 'That all language', says Mr. Peile, 'did originally spring from imitational and interjectional sounds combined—not from one or the other separately, as has been implied sometimes, I for one firmly believe, not seeing any other possible origin for language.' As instances of *onomatopœia* we may adduce the name *cuckoo*, and similar names for the same bird in other languages, all evidently derived from its cry; and the imitative origin of such verbs as *crash*, *cackle*, *boom*, &c., can scarcely be doubtful. But although it is not difficult in some words to trace them back to an *onomatopœic* origin, by far the greater proportion of words in every language have so changed from their original shape in course of time, that it is utterly impossible to exhibit how, from originally representing sounds, they came to have their present senses. Usually we must be content to trace them back to certain forms known as 'roots'. These roots are ascertained by *analysis*, that is, by separating the part containing the fundamental sense from the elements used to modify it. One or two examples must suffice. 'In the English word *enmity*', says Mr. Wedgwood, 'we recognize the termination *ty* as the sign of an abstract noun, and we understand the word as signifying the state or condition of an *enemy*, which is felt as the immediate parent of the English word. Now, we know that *enemy* comes to us through the French *ennemi* from *L. inimicus*, which may itself be regularly resolved into the prefix *in* (equivalent to our *un*), implying negation or opposition, and *amicus*, a friend. In *amicus*, again, we distinguish the syllable *-us* as the sign of a noun in the nominative case; *-ic*, as an element equivalent to the German *-ig*, or English *-y* in *windy*, *hairy*, &c., as an adjective termination indicating possession or connection with; and finally, the radical element *am*, signifying love, which is presented in the simplest form in the verb *amo*, I love. Here our power of analysis is brought to a close.' Similar analyses of the words *immortality*, *stability*, bring us to the widely spread roots *mr*, *mar*, to grind, and *st*, *sta*, to stand, both of which are common to various European tongues; and by similarly analysing *immemorial*, for instance, we get as the ultimate result a root, *mn*, to think (from a simpler root, *ma*, to measure), common also to a number of languages. Now this identity of root in the various tongues is not accidental, neither is it to be explained by the classical and other forms being borrowed or *derived*, say from the Sanskrit. The words in which these roots appear are *cognate*, that is, they have a common origin, and point to a time when the ancestors of the peoples using them formed part of one common family. This common family is believed by many to have had its early home in Western Asia, and their tongue has been called the Aryan tongue, while the languages of which it is the parent have been called the Aryan or Indo-European family of tongues. This distinction between *cognition*, or relationship, and *derivation* is always to be clearly kept in view. We find, for instance, that the Latin language has words similar in form and meaning to our *father*, *mother*, *brother*; but these words of ours are not de-

rived from Latin *pater*, *mater*, *frater*, though *pater-nal*, *maternal*, *fraternal*, are clearly so derived, as are French *père*, *mère*, *frère*. So also if we find that the words *father*, *mother*, *brother*, &c., are represented by similar words in German, Dutch, Icelandic, Irish, Greek, &c., we are not to think that any borrowing or derivation has taken place, the fact being that these words belong to the common Indo-European vocabulary. (See *INDO-EUROPEAN LANGUAGES AND PHILOLOGY*.)

As is well known, however, English has borrowed a large number of vocables from other tongues, and in the majority of cases we can trace these back to the source from which they have been derived. The principal constituent of our English vocabulary, in addition to the purely English (Anglo-Saxon) inherited element, is Latin, either taken direct or through the medium of the French. Besides Latin, we have many words from Greek, Spanish, Italian, Portuguese, Celtic, &c., and from the tongues of distant countries with which we are connected by commerce, colonization, and the like. The words we get from Greek are mostly of a learned or scientific character, as *philology*, *archæology*, *zoology*, *æsthetics*, *mathematics*, *geology*, *geography*, &c. The Roman occupation of Britain left us only a few words, chiefly local names connected with military stations—*caester*, *caster*, from *castra*, a camp, as *Lancaster*; *street*, *strat*, from *strata* (*via*), a paved way, as *Stratford*; *coln*, from *colonia*, a colony, as in *Lincoln*. The introduction of Christianity brought in many Latin words of a religious character, as *altar*, *chalice*, *cloister*, *creed*, *fast*, *font*, *mass*, *pagan*, *pall*, *porch*, *preach*, *saint*, *shrine*, *sacrament*, &c. The principal accession, however, to our language from the Latin came to us through the Normans, from whom we got most, if not all, words relating to feudalism and war, as *array*, *assault*, *baron*, *battle*, *champion*, *chivalry*, *dover*, *esquire*, *fealty*, *peer*, *soutage*, *soutcheon*, &c.; to law, as *arrest*, *assize*, *contract*, *estate*, *filony*, *judge*, &c.; and to the chase, as *brace*, *chase*, *couple*, *covert*, *falconer*, &c. Almost all the Latin words which passed into the French language suffered abbreviation and other changes, and the words coming to us through that channel naturally exhibit this characteristic. Those which we took from Latin direct, or which the French had themselves taken directly from the Latin, retain their stem entire, and are modified chiefly in their terminations so as to accommodate them to our grammar, which is strictly of the English or Teutonic type. Compare *desire*, *desiderate*; *envious*, *invidious*; *dowry*, *dotation*; *sure*, *seure*; vowel, *vocal*; *rule*, *regular*; *loyal*, *legal*; *royal*, *regal*; *round*, *rotund*; *mean*, *medium*; &c. &c.; where the second word in each case is less modified in form than the first, being derived more directly from the Latin. It will be observed that though of common origin, they do not exactly agree in sense. No language, as a general rule, is so rich in vocables as to be able to appropriate two forms to exactly the same signification and use. It will very often be found, therefore, that we have made over the word we have taken from the French to the language of common life, while the word of directly Latin origin is used on occasions of formality and ceremony. A similar duplicity of form and sense is observed in those Germanic words which come to us both from a Norman and a native source. Compare *wise*, *guise*; *word*, *guard*; *warrant*, *guarantee*; *wile*, *guile*; *wage*, *gage*; &c. &c. In each of these the former word is native, and the latter Norman. The French word *guerre*, from Old High-German *weira*, shows not only how Germanic words were modified in Gaul either through Celtic or, as Mr. Peile suggests, through Latin influence, but also

how the Franko element in the population of that country, like the Ocean among the Latins, dictated the military terms. As an example of the tendency of the French to soften down or elide the Latin and Greek consonants, we may notice the different treatment the Greek word *episkopos*, Latin *episcopus*, received on entering the French and English languages. By cutting off the terminal part we get the crude stem *episkop*, which the French transmuted first into *evesque* and then into *evêque*. The early English, with their usual fondness for the aspirated sibilant, contented themselves with changing *sk* into *sh* and *p* into Low-German *b*, making the word *bischoep*, *bishop*.

The Celtic elements of modern English are divisible into three classes:—(a) Those words which were handed down from the original Celts of Britain and now form part of the language. This class includes many names for natural objects which are not so much used as distinct generic words as constituents of place-names. Among these are, *aber*, *inver*, *humber*, *cumber* (all forms of the same word, *Cumry* being allied to them), *ard* (high), *ath* (a ford), *auchter* (a summit), *ough* (a field), *avon* (water), *bal*, *bally* (a town), *ben* (a hill), *car*, *caer* (a fort), *cairn* (a heap of stones), *cam* (crooked), *cambus* (a curve), *craig*, *carrick* (a crag), *drum* (a ridge), *dun* (a fort), *innis*, *inch* (a pasture—hence a small island pasture), *ken*, *can* (a head), *knock* (a hill), *lin*, *linn* (a pool), *more* (great), *ross* (a promontory), *strath* (a valley), &c. It includes also some words common in the current language, as *babe*, *bald*, *clout*, *darn*, *drudge*, *gown*, *gag*, *lad*, *lass*, &c. (b) Those of late introduction, which, though true Celtic words, are not original constituents of our tongue, as *flannel*, *clan*, *loch*, *plaid*, *whisky*, &c. (c) Those that have come to us from the Celtic through some other tongue, Latin or Norman-French, as *druid*, *bard*, *brave*, *garter*, &c.

Din (a noise), *forre* (a waterfall), *gar* (to make), *gill* (a ravine), &c., and several place-names, as *Whithy*, *Derby*, *Seathwaite*, *Scafell*, are from the Scandinavian. From the Hebrew we take *ephod*, *cabala*, *cherubim*, *seraphim*, *amen*, &c.; from Arabic, *admiral*, *alchemy*, *almanac*, *giraffe*, *gazelle*, *coffee*, *sugar*, *lemon*, *syrup*, *sofa*, *mummy*, *assassin*, *sherbet*, &c.; from Persian, *caravan*, *dervish*, *azure*, &c.; from Turkish, *scimitar*, *divan*, &c.; from Chinese, *gong*, with the specific names of various teas, as *bohea*, *hyson*, *ongou*; from Malay we have *bantam*, *sago*, *gamboge*, *amuck* (as to run *amuck*); from India, *calico*, *chintz*, *toddy*, *curry*, *lac*, &c.; from the West Indies, *tobacco*, *potato*, *maize*, &c.; from North America, *squaw*, *wigwam*; from South America, *hammock*, *jerked* (as in *jerked* beef), &c. There are many words thoroughly naturalized in the language that are quite unique in their origin; thus, *simony* is from *Simon*, who thought that the Holy Ghost was to be bought with money; *dunce*, from *Duns* Scotus; *negus*, from a Colonel *Negus*, skilled in mixing this drink; *orrey*, from the Earl of *Orrey* and Cork. Similar words are *brougham*, *dahlia*, *tonine*, *mackintosh*, *daguerreotype*, *silhouette*, &c. From names of places we have *cuvant* (Corinth), *copper* (Cyprus), *cordovan* (Cordova), *damask* and *damscon* (Damasus), &c. The word *crawfish*, a crab, exhibits one of the somewhat singular freaks of etymology. The English *crab* is allied to German *krebs*, which last the French borrowed, converting it into *crevasse*. This we took from the French under the form *creveys*, which has now assumed the very English form *crawfish*. Sometimes, on the other hand, two words are confounded under one form, and the distinction between them is only clearly perceived when regard is had to their etymology; thus, under the form *rest*, we have a derived word signifying *remainder*, from Latin *resto*, to remain, and a native

word signifying *repose*, cognate with German *ruhe*, Dutch *rust*, ease, quiet, repose.

The root, as we have said before, is the significative part of a word; thus, *baïr-a*, Old English *ber-a*, *bar-a*, a child, is made up of the root *baïr*, to bear, and suffix *a*. Suffixes, which are largely employed in English, serve to modify the root-meaning; thus, the *a* in *baïr-a* is identical with *en* in the past participle of strong verbs; hence *baïr-a* = (one) born or brought forth. So by adding the suffix *-der*, which denotes the agent or instrument, to the verb *spin*, we get *spi(n)der*, *spider*, the spinner; by adding the suffix *-dom*, signifying state or quality to *heathen*, *martyr*, we have *heathendom*, *martyrdom*, the state of a heathen, a martyr. The suffixes *-ship*, *-hood*, *-red*, *-age*, have the same signification as *-dom*; thus, *lordship*, *friendship*; *manhood*, *childhood*; *kindred*, *hatedred*, *bondage*, *parentage*. The suffix *-ric* denotes jurisdiction, as *bishopric*; *-er*, *-yer*, profession, trade, as *cooper*, *cobbler*, *lawyer*, *sawyer*; *-ry* or *-ory*, collection, as *rookery*, *peasantry*, *gentry*, &c.; *-ly*, like, as *courtly*, *godly*, and so on. Suffixes were once independent words, which, by being appended to principal roots to modify their meaning, gradually lost their independence, becoming mere signs of relation, and being employed only as formative elements. This is clearly seen in the suffixes *-ric* and *-ly*, the former being simply the Old English (Anglo-Saxon) *rice*, a kingdom, dominion, while the latter is merely a contraction of Old English (Anglo-Saxon) *lic*, like, as *godlic*, *godly*, *earthly*, &c. The French affix *-ment* is adduced by Max Muller as affording an illustration of this principle. It is the distinctive adverbial suffix; thus, from *bon* we have *bonnement*; from *crud*, *vraisment*. 'This termination does not exist in Latin. But we meet in Latin with expressions such as *bond mente*, in good faith. We read in Ovid, 'Insistam forti mente,' I shall insist strongly; in French, 'J'insisterai fortement.' Therefore, what has happened in the growth of Latin, or in the change of Latin into French, is simply this: in phrases such as *forti mente*, the last word was no longer felt as a distinct word, and it lost at the same time its distinct pronunciation. *Mente*, the ablative of *mens*, was changed into *ment*, and was preserved as a mere formal element, as the termination of adverbs, even in cases where a recollection of the original meaning of *mente* (with a mind) would have rendered its employment perfectly impossible.'

Words are also modified by prefixes, which in English are of two kinds—those of native origin, and those from classical sources. Of the former we have *a*, on, as *abed*, *aboard*; *be*, by, as *before*, *beside*; *be*, converting intransitive into transitive verbs, or adding intensity to the meaning, as *bespeak*, *bespatter*; *for*, denoting privation or prohibition, as *forbid*, *forbear*; *n*, *ne*, not, as *never*, *neither*; *en*, converting adjectives and nouns into verbs, as *ennoble*, *entomb*, &c. &c.: of the latter, *a*, *ab*, *abs*, from, as *avert*, *abuse*, *abstract*; *co*, *com*, *con*, together, as *copartner*, *company*, *contact*; *de*, down, as *descend*; *in*, in, into, as *invid*, *imprison*; *in*, not, as *inactive*; *ob*, *oc*, *of*, *op*, against, as *obstruct*, *occur*, *offend*, *oppose*; *re*, motion from, reversal, as *recall*, *return*, &c. &c.

When two words, each of which retains an independent meaning, are united into one, the resulting word is said to be formed by *composition*, and is called a *compound*. Words are thus formed either by combining two native words or two foreign ones, or by making hybrids. *Kinsman*, *bridegroom*, *twilight*, *blackbird* are native compounds. In some the elements have become changed or obsolete, and are not easily recognized, for example, *bun-dog* (*bond-dog*), *bridal* (*bride-ale*), *kuzzy* (*hus-wif*), *gospel* (*god-spell*), &c. *Aqueduct*, *geography*, *abnormal*, are pure foreign

compounds. *Mobocracy, bigamy, handkerchief* are hybrids.

EU (Latin, *Augs*), a town in France, in the department of Seine-Inférieure, near the left bank of the Breale, 2 miles above its mouth in the English Channel, 17 miles north-east of Dieppe. It stands in a finely wooded valley, and was in early times a place of considerable importance. Besides the castle, which is a lofty pile of imposing exterior, it has a noble cathedral, another Gothic church, and an old embattled gate, said to be Roman. It was in the castle belonging to this place that William the Conqueror married Maud of Flanders. The town was burned to the ground in 1475, by order of Louis XI., to prevent it from falling into the hands of the English. Pop. (1896), 4362.

EUBCEA. See NEGROPONT.

EUBULUS, a Greek comic writer belonging to the middle comedy, who flourished at Athens about B.C. 376. His subjects were chiefly mythological, and many of his plays contained parodies of the tragic poets, especially Euripides. His language appears to have been simple, elegant, and pure.

EUCALYPTUS, a genus of trees deriving its name from the well-marked connection of the calyx with its lid or *calyptra*, which is forced off by the pistils and stamens when blossoming. These trees are mostly natives of Australia, and are remarkable for their gigantic size, some having been discovered which surpass in size even the *Wellingtonia gigantea*. Ferdinand Müller, the botanist, says that trees of the species *Eucalyptus amygdalina*, 480 feet in length, were met with lying on the ground. *Eucalyptus obliqua* is the scientific name of the white gum-tree. The appearance of a white gum-tree forest has no counterpart in the northern hemisphere. From the base of the trunk up to the minutest branches the bark of the tree is perfectly white, and the leaves of a leek-green colour. The leaves contain an essential oil which enables them to withstand the aridity and heat of the climate. The so-called gum which exudes from the trunk of this tree is not a true gum, but a gum-resin of a highly stringent quality. An important species of this tree is the *Eucalyptus globulus* or Blue-gum tree of Tasmania and Australia, which has attracted a great deal of attention, both on account of its commercial importance, and of its value in a sanitary and medical point of view. Its value as a timber tree has long been known in the Australian colonies, where it is much employed in shipbuilding, house carpentry, mill-work, bridge-building, &c. The timber is exceedingly strong and durable, like that of several others of the genus; it is never attacked by insects, and is almost proof against the action of water. The tree grows very rapidly, as much as 12 to 18 feet annually, and reaches a height of 250 feet, with a diameter of 20. It has been introduced into France, Spain, Italy, Algeria, &c., and thrives very well in Europe, though, of course, it is only certain parts of this continent that have a temperature mild enough for it. In the neighbourhood of Cannes seedlings a year old planted out in the month of May in a favourable soil have reached the height of 18 feet in the following December, and trees seven or eight years old are from 60 to 80 feet high. Its commercial importance is great, but its medical and sanitary properties are no less important. When a plantation of eucalyptus has been formed in a marshy and malarious locality, such as the delta of the Var, the Campagna of Rome, the coasts of Corsica, &c., it has the effect of destroying the noxious miasmata, and of freeing the locality from the fevers so prevalent in such districts. This result it brings about no doubt partly by draining the soil (as it absorbs an immense quantity of moisture), but

the balsamic odour which it gives out may also assist, as well as the leaves and bark that drop on the ground. The tree also affords an essence (eucalyptol) which possesses valuable febrifuge, antispasmodic, and antiasmatic properties, and is a valuable addition to the pharmacopœia. This essence has an agreeable and peculiar aromatic odour, compared by some to that of camphor, by others to that of the rose or of lavender. It is most abundant in the leaves and flowers of the tree, less so in the wood and bark. In Australia the eucalyptus is a popular remedy for fever, and in Europe it has been found very effective, especially in the case of intermittent fever. In the south of Spain it is already known by the name of the 'fever tree.' It has also been successfully used as a disinfectant in the dressing of wounds, as an astringent in affections of the respiratory passages, in purulent catarrhal affections of the urethra or vagina, &c. It is administered in various forms, a powder of the leaves being the most common, but it is also taken in the form of a decoction or infusion, of an alcoholic extract, &c., and cigarettes made of the leaves are also smoked.

EUCHARIST (from the Greek *eucharistia*, thanksgiving, from *eu*, well, and *charis*, grace), a name for the Lord's supper, because the Scriptures inform us that Christ, after having taken the wine and bread, blessed them (or gave thanks). See SACRAMENT and CORPUS CHRISTI.

EUCLASE, a rare and beautiful mineral found in Brazil, Peru, and Siberia, which, if more abundant, might be employed for jewelry. It is a silicate of glucinum and aluminium, forming oblique prisms variously modified, transparent, highly lustrous, and very hard; colourless, but sometimes blue or green.

EUCLID (*Eukleides*), of Megara, the founder of the Megaric school of philosophy. He was a pupil of Socrates, after whose death, B.C. 399, he retired to Megara (most probably his native city) and set up a school of philosophy, in which he blended the doctrines of the Eleatic school with those of his master. He adopted the Eleatic notion of one universal unchangeable existence, and upon this he grafted the ethical views of Socrates, giving the name of the Good (sometimes also of Reason, Intelligence, &c.) to this universal existence. From its subtlety and disputativeness, the school of Euclid was sometimes called the Dialectic or Eristic.

EUCLID (*Eukleides*), of Alexandria, a distinguished mathematician, flourished about 300 B.C., and taught geometry at Alexandria in the reign of Ptolemy Soter, and extended the boundaries of mathematical science. The severity and accuracy of his method have never been surpassed. His *Elements* (*Stoicheia*), in thirteen books, are still extant, and still form the most useful introduction to the study of geometry. The following are the three best editions of the original text of Euclid's *Elements*: 1. The Oxford edition of David Gregory, forming part of the only edition of the original of the complete works of Euclid (folio, 1703); 2. The edition of Peyrard, in Greek, French, and Latin, accompanied by the *Data* of Euclid (Paris, 1814-16-18); 3. That of E. F. August (Berlin, 1826). The translations in all languages are numerous. Among the English translations are Dr. Robert Simson's, containing the first six and the eleventh and twelfth books (London, 1756), and Professor John Playfair's, containing only the first six books (Edinburgh, 1795). The other extant works attributed to Euclid are the *Data* (the only other allowed by Peyrard to be genuine); the *Phænomena*, an astronomical treatise; *Treatises on Optics and Catoptrics*; and two treatises on Music, one on Harmonics and the other on the Division of the Scale. The genuineness of both of the last two

treatises, and more especially of the second, has been very generally questioned.

EUDIALITE, a mineral found in Greenland, which, when powdered, dissolves readily in hydrochloric acid with the separation of gelatinous silica. It consists of lime, soda, and iron in combination with zirconia and silica, and containing minute quantities of tantalum, manganese, and other elements. It occurs in uniform masses of a red colour, and the crystals belong to the hexagonal system.

A variety of this mineral found in Norway is called **EUCOLITE** or **EUKOLITE**. It contains cerium and lanthanum, but in other respects resembles eudialite.

EUDIOMETER, an instrument for ascertaining the purity of air, or rather the quantity of oxygen contained in any given bulk of elastic fluid. Dr. Priestley's discovery of the great readiness with which nitric oxide combines with oxygen, and is then condensed into nitrous and nitric acids, was the basis upon which he constructed the first instrument of this kind. It consisted of a glass vessel, containing an ounce by measure. This was filled with the air to be examined, which was transferred from it to a jar, of $1\frac{1}{2}$ inch diameter, inverted in water; an equal measure of nitric oxide was added to it, and the mixture was allowed to stand two minutes. If the absorption were very considerable, more nitric oxide was added, till all the oxygen appeared to be absorbed. The residual gas was then transferred into a glass tube, 2 feet long and $\frac{3}{4}$ inch wide, graduated to tenths and hundredths of an ounce measure; and thus the quantity of oxygen absorbed was measured by the diminution that had taken place. Other eudiometrical methods were employed by other chemists. Volta had recourse to the detonation of air with hydrogen gas. For this purpose two measures of hydrogen gas are introduced into a graduated tube, with three of the air to be examined, and fired by the electric spark. The diminution of bulk observed after the vessel had returned to its original temperature, divided by three, gives the quantity of oxygen consumed. The action of liquor prepared from sulphur and potash, or sulphur and lime, boiled in water, and the slow combustion of phosphorus, have likewise been employed in eudiometry. Dobereiner suggested the use of little balls of spongy platinum, for the purpose of detecting minute portions of oxygen in a gaseous mixture, in which hydrogen is also present. The moment the substance rises above the surface of the mercury, in the tube containing the mixture, the combination of the oxygen and hydrogen begins. Its action consists in condensing the gases either at the surface or within the pores of the metal itself (see **GASES—ABSORPTION**), and so energetic is it that it enables hydrogen to take one part of oxygen from ninety-nine of nitrogen.

EUDOXUS, of Cnidos, whom Cicero calls the prince of astronomers, lived about B.C. 370, was the scholar and friend of Plato, and travelled into Egypt, where he continued for thirteen years in intimate intercourse with the priests. All his works are lost, but the poem of Aratus on astronomy makes us acquainted with the extent of his astronomical knowledge, for the commentary upon this poem by Hipparchus shows that it is nothing else than a metrical version of the *Phænomena* of Eudoxus, a work written in prose. Hipparchus has preserved some fragments of the work of Eudoxus for comparison with that of Aratus, and from these it appears that Eudoxus was far from being a competent observer of the heavens, although he does not fall into so many or so gross errors as his versifier. Eudoxus seems to have been the first to introduce an astronomical globe into Greece, and this may account for the great reputation which he acquired and long continued to enjoy.

EUGÈNE, **FRANÇOIS**, of Savoy, known as prince Eugene, fifth son of Eugene Maurice, duke of Savoy. Calignan, count of Soissons, and Olympia Mandini, a niece of Cardinal Mazarin, was born at Paris, Oct. 18, 1663. Among all the generals and statesmen of Austria, none has rendered more numerous and important services than Eugene. He was great alike in the field and the cabinet. Contrary to his own inclinations, Eugene was destined for the church. He petitioned Louis XIV. for a company of dragoons, but was refused on account of the opposition of Louvois, minister of war, who hated the family of Eugene. Indignant at this repulse, and at the insults offered to his family, and particularly to his mother, Eugene, in 1683, entered the Austrian service, as two of his brothers had already done. He served his first campaign as a volunteer against the Turks, under two celebrated generals, Charles, Duke of Lorraine, and Louis, Prince of Baden, with so much distinction that he received a regiment of dragoons. The distinction he earned at the siege of Belgrade in 1688, at that of Mayence in 1689, and elsewhere, procured for him rapid promotion. Louvois, jealous of the reputation of Eugene, said angrily, 'He shall never return to his country.' Eugene, to whom these words were reported, replied, 'I shall return in spite of Louvois'; and in fact some years afterwards he entered France at the head of a victorious army. War having broken out between France and Austria, he prevailed upon the Duke of Savoy to enter into an alliance with the emperor, and in 1690 received the command of the imperial forces sent to Piedmont to act in conjunction with the troops of the Duke of Savoy. He rejected the tempting offers made by France to engage him in her service, and was raised by the emperor to the rank of general field-marshal. After the war in Italy was concluded he was sent to Hungary with the rank of commander-in-chief. He defeated the Turks at the battle of Zenta (September 11, 1697), and obtained on that occasion the applause of Europe, and the entire confidence of the imperial armies, although his enemies, envious of his glory, accused him of temerity in undertaking so hazardous an enterprise. The loss of the Turks at Zenta obliged them to accede to the Peace of Carlowitz, 1699, which was the first symptom of their decline.

The Spanish war of Succession next called Eugene to a new theatre of glory. Italy became the field in which he displayed his military talents. He advanced rapidly through the passes of the Tyrol at the head of 30,000 men, in the face of Marshal Catina, who endeavoured in vain to arrest his progress. Villeroy was still more unsuccessful, being surprised and defeated, near Cremona, by Eugene (1702). In 1703 he received the command of the army in Germany; and, being appointed president of the council of war, he was the soul of all important enterprises, to which he imparted great activity; and his efficient co-operation with Marlborough frustrated the plans of France and her allies. In the battle of Höchstädt (Blenheim, see **BLENHHEIM**), August 13, 1704, the two heroes gained a decisive victory over the French and Bavarian army, commanded by the Prince of Bavaria and Marshal Tallard, the latter of whom was made prisoner. In 1705 Eugene returned to Italy, where he was severely wounded in an engagement with the French under the Duke de Vendôme, and being obliged to retire from the field, his army was defeated; but Vendôme was recalled, and his successor, the Duke de la Feuillade, could not withstand Eugene, who now hastened to the relief of Turin, stormed the French lines, forced them to raise the siege, and in one month drove them out of Italy. In 1707 he entered France, and laid siege to Toulon;

but the immense superiority of the enemy obliged him to retire into Italy. During the following years he fought on the Rhine, took Lille, and, in conjunction with Marlborough, defeated the French at Oudenarde (1708), and Malplaquet (1709), where he himself was dangerously wounded. In this situation he maintained that calmness peculiar to great souls: when the officers urged upon him the necessity of having proper surgical attention, 'What need of bandages,' said he, 'if we are about to die here? If we escape, the evening will be time enough.'

After the recall of Marlborough, which Eugène opposed in person, at London, without success, and the defection of England from the alliance against France, his farther progress was in a great measure checked, more particularly after the defeat of General Lord Albemarle at Denain. The Peace of Rastadt, the consequence of the Treaty of Utrecht, was concluded between Eugène and Villars in 1714. In the war with Turkey, in 1716, Eugène defeated two superior armies at Peterwardein and Temesvar, and, in 1717, took Belgrade, after having gained a decisive victory over a third army that came to its relief. The Treaty of Passarowitz (concluded in 1718) was the result of this success. During fifteen years which followed, Austria enjoyed peace, and Eugène was as active in the cabinet as he had been in the field, when the Polish affairs, in 1733, became the cause of a new war. Eugène appeared, in his old age, at the head of an army on the banks of the Rhine, but returned to Vienna without effecting anything of importance. He died in 1736. See Col. Malleton's Prince Eugène of Savoy (1888).

EUGENE DE BEAUHARNAIS. See **BEAUHARNAIS**.

EUGENIC ACID, or **EUGENOL** ($C_{10}H_{12}O_2$), a substance occurring in oil of cloves, and also in the oils obtained from the leaves of the cinnamon and laurel, in that from the fruit of *Myrtus Pimenta*, and several others. The first-mentioned oil contains, in addition to eugenic acid, the hydrocarbon terpene. When it is mixed with potash, a soft crystalline mass is formed, and then, if water be added and the whole distilled, the hydrocarbon passes over, and the residue in the retort, consisting of eugenate of potassium, crystallizes on cooling. From this the eugenic acid is separated by a mineral acid, and is purified by distillation. It is a colourless oily liquid, boiling about 251°C ., with an acid reaction and a burning taste of cloves. It combines with metallic oxides, forming eugenates, several of which are crystalline and soluble in water.

EUGENIUS, the name of four popes.—1. **EUGENIUS I.**, elected Sept. 8, 654, while his predecessor, Martin I., was still living; died in 657 without having exerted any material influence on his times.—2. **EUGENIUS II.** held the see from 824–827.—3. **EUGENIUS III.**, born at Pisa, was a disciple of St. Bernard of Clairvaux, and abbot of the Cistercian Abbey of St. Athanasius at Rome. He was raised to the papedom in 1145, was obliged to quit Rome in 1146 in consequence of the commotions caused by Arnold of Brescia; returned by the help of King Roger of Sicily in 1150, and died in 1153. St. Bernard wrote for him the celebrated tract *De Consideratione Libri V.* In his time the Hohenstaufen house first made good their footing in Italy.—4. **EUGENIUS IV.**, from Venice, originally called Gabriele Condolmieri, was, in 1408, appointed Bishop of Sienna and cardinal, and was raised to the papedom in 1431. During his time the spirit of reformation was strongly manifested at the Council of Basel. In consequence of his opposition to the Council he was deposed by it, and Duke Amadeus VIII. of Savoy was elected pope in his stead, under the name of Felix V. The dissensions

thus produced were not allayed till his death in 1447.

EUGENIUS, Sr., Bishop of Carthage in 480, by his zealous defence of the orthodox faith incurred the hatred of the Vandals, who had embraced Arianism, and in 484 was banished by Hunneric to the deserts of Tripoli. Having been recalled by Gundamund, he was again arrested about eight years after by Thrasimund, who condemned him to death, but commuted the sentence to banishment. Eugenius went to Vienne in Languedoc, and founded a monastery, in which he lived till his death in 505. A profession of faith bearing the name of Eugenius, and presented by the African orthodox bishops to Hunneric, is still extant. His festival is on the 18th of July.

EUGUBINE TABLES, the name given to seven bronze tables found in 1444 at the town of Gubbio, the ancient Iguvium or Eugubium, now in the Italian Province of Perugia, bearing inscriptions in a language decided to be that of the ancient Umbrians. These tables are the most important monument of the language in which they are written. Four of the tables are inscribed in Etruscan characters, two in Latin, and the remaining one partly in Etruscan and partly in Latin. For a long time scholars were unable to decipher them, but they have at last, with the aid of comparative philology, succeeded in overcoming most of the obstacles in the way of their interpretation. The contents of the tables are of no great interest. They refer to the ritual of the priests of the Temple of Jupiter, and indications are found as to the days of sacrifice, and the districts of the town in which each sacrifice took place. Photographic reproductions of the inscriptions, with translations, are given in M. Breal's *Les Tables Eugubines* (1875–78).

EUHEMERISM. See **MYTHOLOGY**.

EUKAIRITE, a rare mineral of a shining lead-gray colour and granular structure, consisting chiefly of selenium, copper, and silver. Its name is derived from the Greek word meaning *opportune*, and was given to it by Berzelius because found soon after the discovery of selenium.

EULENSPIEGEL, **TYLL** (or **TILL**), a name which has become associated in Germany with all sorts of wild frolics, committed from pure love of fun. It appears to have been placed beyond doubt that a person called Tyll Eulenspiegel or Ulenspiegel (literally, 'owl-glass') did at one time live in Germany, probably in the first half of the fourteenth century, and that he was celebrated for the frolics he practised in all parts of Germany, and in some of the neighbouring countries. But with regard to this personage nothing more is known. The popular account of him in Germany is that he was born at the village of Kneitingen (or Kneifingen) in Brunswick, and that he died at Molln near Lubeck, where a grave-stone is still preserved bearing an owl and a glass which is said at one time also to have borne an inscription stating that Tyll Eulenspiegel was buried underneath, and that he died in 1350. This account is, however, mere fable. The evidence of the grave-stone goes for nothing, since the stone is certainly not older than the seventeenth century, and besides, there is another stone at Damme in Belgium which gives equally authentic evidence that Tyll Eulenspiegel has lain buried underneath it since 1301. It is not known at what time all the tricks and frolics currently attributed in Germany to Eulenspiegel were first collected and committed to writing. The earliest edition of Eulenspiegel's adventures is one in High-German, published at Strasburg in 1519 by one Thomas Murner, but he is said to have had for the basis of his edition a collection written in Low-German about 1483. However that may

te, no Low-German account of Eulenspiegel's adventures has come down to our day. As soon as Murner's work appeared, it became very popular, not only in Germany, but all over Europe, and was translated into nearly every European language. In English it first appeared as a miracle-play, with the title, *A Merry Feast of a Man that was called Howleglas*. A new English edition of the work by Kenneth R. H. Mackenzie was published in 1860. A valuable edition of Murner's original collection by J. M. Leppenberg was published at Leipzig in 1854.

EULER, LEONARD, one of the most distinguished mathematicians of the 18th century, was born at Basel, April 15, 1707. He learned from his father, a clergyman, the first rudiments of the science in which he was afterwards so distinguished. At the University of Basel he enjoyed the instructions of John Bernouilli and the friendship of Daniel and Nicholas Bernouilli. In his nineteenth year he gained the accessit of the prize offered by the Paris Academy of Sciences for the best treatise on the masting of vessels. Catharine I., desirous of completing the establishment of the Academy of St. Petersburg, invited Daniel and Nicholas Bernouilli thither. Nicholas died, and Daniel soon returned to his native country, after having procured a place in the academy for his friend Euler. Euler now constituted the whole mathematical department in the academy, and laboured with astonishing industry; he composed more than half of the treatises in this branch of science contained in the forty-six quarto volumes published by the St. Petersburg Academy from 1727 to 1783; and at his death left about 100 unpublished dissertations, which were successively printed by the society. To the Paris Academy of Sciences he also presented several treatises (among the rest his dissertation *Inquisitio physica in Causam Fluxus ac Refluxus Mariæ*, which gained the prize, though Bernouilli and MacLaurin were among his competitors), and carried off or divided ten prizes. In 1741 he accepted an invitation from Frederick the Great to become professor of mathematics in the Berlin Academy, but in 1766 returned to St. Petersburg, where he died in 1783, in the office of director of the mathematical class of the academy.

Euler distinguished himself particularly by his endeavours to perfect the analytic method according to the system of Bernouilli and the Leibnitzian school, and to complete its separation from pure geometry, which Newton's disciples principally employed in their investigations. He first gave the example of those long processes in which the conditions of the problem are first expressed by algebraic symbols, and then pure calculation resolves all the difficulties. In this Euler displayed extraordinary acuteness and a profound as well as inventive genius. He gave a new form to the science. He applied the analytic method to mechanics, and enlarged the boundaries of this science. He greatly improved the integral and differential calculus, of which he afterwards published a complete course, which surpassed everything then extant on this subject. The great questions on the system of the universe, which Newton left to his successors to resolve, were the constant object of Euler's inquiries, and constitute the subjects of most of his prize essays. An extensive optical treatise, *Sur la Perfection des Verres object. des Lunettes*, in the *Mémoires de Berlin* (1747), was the result of his inquiries into the means of improving spectacles. The share which he contributed by this work towards the discovery of achromatic telescopes is sufficient to distinguish his name in this department also. But in his treatises on physics he often proposes untenable hypotheses, and appears only to be seeking opportu-

nities for calculation. He also employed himself in metaphysical and philosophical speculations. He attempted to prove the immateriality of the soul, and to defend revelation against freethinkers. In his well-known *Lettres à une Princesse d'Allemagne*, sur Divers Sujets de Physique et de Philosophie (Berlin, 1768-72), he attacks the Leibnitzian system of monads and pre-established harmony; but it is evident that this was not the field for him to shine in. Of his numerous writings we will only mention here his *Theoria Motuum Planetarum et Cometarum*, his *Introductio in Analysin Infinitorum*, the work already referred to, which has always been regarded as his greatest production—*Institutiones Calculi Differentialis*; his *Institutiones Calculi Integralis*; his remarkably clear *Introduction to Algebra*; his *Dioptrica*; his *Opuscula Analytica*, &c.

EUMENES, the name of two kings of Pergamus. 1. EUMENES I. succeeded his uncle Philetærus, B.C. 263, and shortly after gained a victory over Antiochus Soter, which secured him in the possession of his dominions. He reigned for twenty-two years and then died in a fit of drunkenness.—2. EUMENES II. succeeded his father Attalus, B.C. 197, and, like him, attached himself to the Romans, who, as a reward for his services in the war against Antiochus of Syria, bestowed upon him the Thracian Chersonesus and almost all Asia on this side of the Taurus. He was also indebted to their interference for the successful termination of a war in which he had become involved with Prusias of Bithynia and Pharnaces of Pontus, as well as with the Thracians. At last, however, his conduct in the war against Perseus of Macedonia incurred the suspicion of the Romans, who, in consequence, encouraged his brother Attalus to take arms against him, and also gave ready ear to the complaints brought against him by the King of Bithynia and several Asiatic cities; but before an open rupture was declared Eumenes died, B.C. 159. He greatly extended the library founded at Pergamus by his father, and distinguished himself by his love of literature and science.

EUMENIDES. See FURIES.

EUMOLPUS, a mythical personage of ancient times, celebrated as a poet, warrior, hierophant, and legislator, according to the common tradition a Thracian, the son of Poseidon and Chione, the daughter of Boreas. He is said to have been driven from Thrace for attempting to violate his wife's sister, but to have afterwards returned. The traditions relating to his subsequent career vary. According to one tradition he was requested by the Eleusinians to aid them against the Athenians, and having acceded to the request, was slain in the battle which ensued. According to another tradition it was Erechthon, the leader of the Athenians, who was slain in the battle, after which peace was concluded between the Athenians and Eleusinians, according to which the Eleusinians were to be subject to the Athenians, but were nevertheless to have the sole right of celebrating the mysteries connected with the worship of Demeter, and Eumolpus was to perform the customary sacrifices. The sacerdotal family of the Eumolpides at Athens claimed to be descended from this Eumolpus.

EUNUCHS. See CASTRATES.

EUODIC ALDEHYD ($C_{10}H_{18}COH$) is the oxidized constituent of essence of rue. The corresponding acid is the eleventh term in the series of fatty acids. EUPATARIA, or EUPATONIA, a seaport in Russia, in the government of Taurida, on the Black Sea, 40 miles north-west of Simferopol. Having long been possessed by the Tartars of the Orizmes (who gave it the name of Kooloff or Kesloff), it is more Asiatic than European in its aspect. It was here that the allied forces landed at the

of the Crimean war (Sept. 14–18, 1854). It was unsuccessfully attacked by the Russians, Feb. 17, 1855. Pop. (1897), 17,915.

EUPATORIUM, a genus of plants belonging to the natural order Compositæ, containing a great number of species, many of which are natives of America. Their roots are perennial, possessing a rough, bitter, or aromatic taste; the flowers are small, white, reddish, or bluish, in corymbs. More than thirty species inhabit the United States, among them the *E. perfoliatum* (thorough-wort, or bone-set), a common plant in low grounds throughout the Union. The leaves of this plant are opposite, and two joined together at the base form, apparently, a single leaf perverted by the stem.

EUPEN (French, *Néauze*), a town in Rhenish-Prussia, in a pastoral vale on the Wenzel, near the frontiers of Holland, 7 miles s.e. w. of Aix-la-Chapelle. It is the seat of a court of law and several public offices, and has manufactures of woollen and linen cloth, hats, soap, leather, and chemicals; paper, flax, and worsted mills; an important trade, chiefly in linen and cattle, and seven annual fairs. Eupen owes its manufacturing prosperity to the French refugees who settled here while the town formed part of the Duchy of Limburg, under Austrian rule. After the Peace of Lunéville, when this duchy was ceded to France, Eupen belonged to the department of Ourthe until the Peace of Paris in 1814, when this town, with other portions of Limburg, was ceded to Prussia. Pop. (1895), 15,111.

EUPHEMISM, a figure of speech by which one avoids the use of words which directly express anything improper, disagreeable, or painful, by the employment of phrases that suggest the idea intended to be conveyed, in a more delicate manner or under a more cheerful aspect than the direct terms. Thus the Greeks, in speaking of the Erinyes or Furies, came to call them the Eumenides, or well-disposed, gracious goddesses, and sometimes *semmi theai*, 'the august goddesses.' Thus also nearly all languages have some euphemism for death, or to express the fact that one has died. In the Bible, for example, we have the phrases 'he was gathered to his fathers,' 'he has fallen asleep,' &c.; the Romans, with the same intention, said 'he has lived' (*vixit*); the Germans say 'he is ascended' (or *ist hinaufgegangen*), or 'he has been made immortal' (or *ist verewigt worden*), &c.; and we ourselves speak of the 'departed,' or say that 'one has gone to a better world.' The laws of polite intercourse require the frequent use of this figure.

EUPHORBIACEÆ, in botany, a natural order consisting of herbaceous plants, shrubs, or very large trees, which occur in all regions of the globe. Most of them contain an acrid, milky juice. The leaves are usually alternate, sometimes opposite. The flowers are unisexual, generally small, and are very various in their mode of inflorescence. The calyx is monosepalous, with three, four, five, or six deep divisions, furnished internally with scaly and glandular appendages. The corolla is wanting in most genera; where found it is sometimes monopetalous, sometimes composed of distinct petals. In the male flowers the stamens are usually numerous, and are either free or monadelphous. The female flowers are composed of a free, sessile, or stipitate ovary, usually with three cells, each containing one or two suspended ovules. The fruit is dry, or slightly fleshy. Among the genera are the following: *Euphorbia*, *Mercurialis*, *Nicotina*, *Oxotum*, *Jatropha*, *Hura*, *Buxus*, and *Acalypha*. They abound in scutellous. Castor-oil is obtained from the seeds of the *Ricinus communis*. The roots of several species are emetic, of others purgative. *Oxotum tiglium* affords a drastic purgative

oil. In general the family is characterized by acrid, narcotic, and poisonous qualities, residing in a volatile principle that may be dissipated by heat.

EUPHORBIA, a yellowish-white body which is the solidified juice of certain Euphorbiaceæ growing in the Atlas in Africa and in the Canary Islands. In the plant incisions are made, from which an extremely acrid juice issues; this ultimately resinifies. Euphorbia is sparingly soluble in water; it dissolves in alcohol and ether, and has been separated into two resinous bodies. It used to be employed in medicine, but its effects are too violent and dangerous. It is a powerfully acrid substance, inflaming the parts with which it comes in contact. Inhalation of the dust causes violent sneezing, and irritation of the nose, eyes, and face generally. It also acts as a drastic purgative, and it is said to produce sometimes intoxication.

EUPHRASIA. See **EYEBRIGHT**.

EUPHRATES, or **EL FRAT**, a celebrated river of Western Asia, in Asiatic Turkey, having its sources in Central Armenia, at no great distance from the shores of the Euxine, and its embouchure in the Persian Gulf; area of basin, 260,000 square miles; length, including windings, 1716 miles. It is formed by the junction of two large streams, called respectively the Kara-Su and the Mourad-Chai. The sources of the former are situated in the Anti-Taurus, 25 miles s.e. Erzeroum, not more than 90 miles from the s.e. shores of the Black Sea; those of the latter, or Mourad, the most southerly and largest branch, are in the same range, but 70 or 80 miles further east. These two head streams unite near Kaban Maden, about lat. 38° 58' N.; lon. 38° 30' E.; from which point the river holds in the main a south-easterly course, until it falls into the Persian Gulf. At Korna, about 100 miles from its mouth, it is joined by the Tigris, and the united streams take the name of the Shatt-el-Arab. In point of current the Euphrates is for the most part a sluggish stream; for except on the height of the flooded season, when it approaches 5 miles an hour, it varies from 2½ to 3½, with a much larger portion of its course under 3 than above. The upper portion of the river is inclosed between two parallel ranges of hills, covered for the most part with high brushwood and timber of moderate size, having a succession of long narrow islands, on several of which are moderate-sized towns. Towards Lemnol or Lemloom (lat. 31° 46' N.; lon. 44° 59' E.) the country is level, and little elevated above the river; irrigation is therefore easy, and in consequence both banks are covered with productive cultivation, and fringed with a double and nearly continuous belt of luxuriant date-trees, extending down to the Persian Gulf. The Shatt-el-Arab has a depth of from 3 to 5 fathoms, and presents banks covered with villages and cultivation. The most important town on the Shatt-el-Arab is Basora or Basra. The melting of the snow in the mountains along the upper part of the river's course causes the Euphrates to rise. This takes place about the beginning of March, and it increases gradually up to the end of May. The river continues high for thirty or forty days; but afterwards there is a daily decrease. From the middle of September to the middle of October the river is at the lowest. The Euphrates is navigable for a long distance from the sea, but there are numerous rapids. Steamers navigate the Shatt-el-Arab. Between the Euphrates and the Tigris lies the celebrated region Mesopotamia. The Karun from Persia is an important tributary of the Shatt-el-Arab. (See **SUPPLEMENT**.)

EUPHROSYNE (Mirth). See **GRACE**.

EUPHUISM, an affected style of speech which distinguished the conversation and writings of many of the wits of the court of Queen Elizabeth. The

name and the style were derived from the Euphuæ, the *Anatomy of Wit* (about 1580), and the Euphuæ and his England (about 1582), of John Lyly; of which Anthony-a-Wood said: 'Our nation is indebted for a new English in them, which the flower of the youth thereof learned.' These books, which became the model of the wits and gallants of the time, and an acquaintance with which was regarded as a test of courtly breeding, were characterized by smoothness and verbal elegance, and chiefly by fantastic similes and illustrations. Most of our readers will recollect Sir Walter Scott's portrait of a Euphuist, or talker of this jargon, in the character of Sir Piercie Shafton, in the *Monastery*.

EUPHONIE, Reichenbach's name for a fragrant colourless liquid produced in the destructive distillation of bones, wood, coal, &c. Some consider that it is a product of the purification of the crude distillate, while Frankland says that it consists chiefly of amyle hydride. It is highly volatile and inflammable; it is insoluble in water, but mixes with oils, and acts as a solvent for fats and resins. It is not readily acted on by ordinary chemical reagents.

EUPOLIS, an Athenian comic poet, classed by Horace with Aristophanes and Cratinus, flourished about 429 B.C., the year in which he is said to have exhibited his first drama. Neither the date of his birth nor that of his death is known with certainty. He is said to have been in his seventeenth year when he exhibited his first drama, which would place his birth about 446 B.C.; and it seems to be not unlikely that he perished in the battle of Cynossema, 411 B.C. He belongs, like Aristophanes and Cratinus, to the Old Comedy. According to Suidas he composed seventeen pieces, seven of which were crowned. His fragments have been collected by Meineke in his *Fragments of the Greek Comic Poets*, and by Bothe in the *Frag. Comic. Græc.*, belonging to the *Bibliothèque grecque* of A. F. Didot.

EURASIANS (synecopated from *Europ-Asians*), a name sometimes given to the 'half-castes' of India, the offspring of European fathers and Indian mothers. They are particularly common in the three presidential capitals—Calcutta, Madras, and Bombay. They usually receive a European education, and speak English with grammatical correctness, although with an accent not altogether agreeable to English ears. The girls, in spite of their dark tint, are generally very pretty, and often become the wives of young officers or civil officials. The sons usually receive appointments in the civil service, or become clerks in merchants' offices. In these situations they are in general very useful, but when they are advanced to higher stations they often become fast in their living, and insolent in demeanour. Although they now find admittance into the best society, they are not as a rule much thought of by Europeans. They are also often spoken of as *East Indians*.

EURE, a river of France, which has given its name to two departments—that of the Eure, and that of the Eure and Loir. The river rises in the department of the Orne, and falls into the Seine, on the left bank, near Pont-de-l'Arche, after a course of 124 miles, being navigable for about half the distance.

EURE, a department in France, bounded on the N. by the department of Seine-Inférieure, N.E. Oise, S. Eure-et-Loir, S.W. Orne, and W. Calvados; area, 2300 square miles. The surface consists of an extensive plain, subdivided by the rivers which water it into a number of minor plains, which nowhere rise more than 800 feet above the level of the sea. In all these plains the surface appears almost monotonously flat, except at their edges, where the descent to the streams which separate them is generally narrow and abrupt. The Seine, which, by its estuary,

bounds the north-west portion of the department, traverses a considerable portion of it in a north-west direction, and receives all its other streams. The climate, though somewhat humid and variable, is temperate, and not unhealthy. Almost the whole surface is profitably occupied, the waste not amounting to one-thirtieth of the whole. Nearly two-thirds are arable, and one-fifth under wood. The vine grows vigorously, but the climate is not so genial as to allow the cultivation of it on a large scale for the purpose of making wine. Its place is found to be more profitably occupied by the plum, cherry, apple, and pear. From the last two much excellent cider and perry are made. In particular spots hemp and flax of excellent quality are grown. The rearing of stock is well understood, and attracts considerable attention. The horses in particular form a lucrative branch of trade. Both game and fish are abundant. The mining and manufacturing works are extensive and important. The smelting and working of iron, copper, and other metals employ about 50,000 people, the copper and zinc works at Romilly being very extensive. The quarries produce building-stone, millstones, and pavement, and there are good seams of fuller's earth and potter's clay. Manufactures have made considerable progress. Among others may be mentioned fine woollen cloth (the celebrated draps de Louviers), linen and cotton fabrics, prints, cotton hosiery, woollen covers, and carpets, ironmongery, pins, leather, paper, glass, and Paris lace. The trade includes, in addition to these articles, cider, perry, cattle, horses, wool, flax, and hemp. For administrative purposes the department is divided into five arrondissements—Evreux, Les Andelys, Bernay, Louviers, and Pont-Audemer; and thirty-six cantons. The department of Eure constitutes the bishopric of Evreux. The town of Evreux is the capital of the department. Pop. in 1901, 331,181.

EURE-ET-LOIR, a department in France, bounded on the N. by Eure; W. Orne; S.W. Sarthe; S. Loire-et-Cher; S.E. Loiret; and N.E. Seine-et-Oise; area, 2267 square miles. The surface consists of an extensive plateau of considerable elevation, which in the east presents an almost unbroken flat, very scantily watered, but in the west is less monotonous, being both partially covered by hills and intersected by valleys, in which numerous streams flow. The principal watershed of the department is formed by a ridge of no great height, which stretches across it from south-east to north-west, and divides it into a north and a south basin, traversed by the two rivers which give the department its name—the Eure, which flows north, and carries its waters to the Seine; and the Loir, which takes an opposite direction, and ultimately joins the Sarthe about 13 miles above the place where that river enters the Loire. Each of these rivers receives several small tributaries, and there is also a considerable number of lakes, of which Bois-Ballu is supplied by a series of curious subterranean channels. The waste-land is extremely limited, amounting to little more than one-hundredth part of the whole. Little more than one-tenth is occupied with wood. Almost all the rest is arable, but a considerable extent is occupied by orchards and vineyards. The produce of the orchards is made into excellent cider, but that of the vineyards affords a very indifferent wine. The soil is in general excellent, consisting of a heavy loam, admirably adapted for wheat. In several districts the soil is of a lighter texture, and is better adapted for barley and oats. In some places hemp, flax, and madder are principal crops. Artificial meadows are extensive, and the art of irrigation is well understood and generally practised. The domestic animals include horses, cattle, and sheep, of good breeds. Great numbers of swine

are reared, and large supplies of poultry are sent to the Paris market. Game, particularly hares, rabbits, partridges, and plovers, is very abundant. The only mineral of any consequence is iron, which is worked at several spots, but not very extensively. The department being essentially agricultural, has few manufactures. Eure-et-Loir is divided into four arrondissements—Chartres, Châteaudun, Dreux, and Nogent-le-Rotrou; and twenty-four cantons. The capital of the department is Chartres. Pop. in 1896, 277,523; in 1901, 272,624.

EURIPIDES, a celebrated Athenian tragedian, born, according to the usual account, B.C. 480, of Athenian parents, at Salamis, on the very day on which the Persian fleet was defeated in the neighbourhood; died B.C. 406. The date given for his birth by the Arundel marbles is 485 B.C.; and Müller upholds the date 481 B.C., on the ground that Eratosthenes states him to have been seventy-five at his death. At first he studied painting, but afterwards applied himself to rhetoric, under Prodicus, and to philosophy under Anaxagoras (not Socrates). Euripides is said to have begun to write tragedies at the age of eighteen, but no play was exhibited by him until B.C. 455, the year in which he exhibited the *Peliades*. He was not successful in gaining the first prize till the year 441 B.C., and he continued to exhibit till 408 B.C., when he exhibited the *Orestes*. Most of the short remainder of his life was passed at the court of Archelaus, king of Macedonia, where he was held in the highest honour. He is said to have been torn to pieces by the king's dogs, which were set upon him by two rival poets, Arrhidaeus and Crateuas. The Athenians, wishing to do honour, after his death, to the poet whom the malevolent hostility of a party in Athens had no doubt helped to drive from their city, sent to Archelaus to request that his remains might be given up to them; but the request was refused by Archelaus, who buried them with the greatest honour in Macedonia. The honour paid to Euripides by Archelaus is not the only proof of the estimation in which he was held by foreigners. Plutarch records in his *Nicias* that on the occasion of the destruction of the Athenian army in Sicily, under Demosthenes, and *Nicias* by the Syracusans (413 B.C.), many of those who survived, and were made prisoners, obtained their liberty by reciting to their masters some of the verses of Euripides, and he adds that numbers of them on their return home visited the poet to express their thanks to him. In the same passage Plutarch mentions another case in which an Athenian ship, pursued by pirates, sought refuge in the harbour of the Caunians, who at first refused to admit it, but afterwards consented when they knew that some of the crew were able to repeat a few fragments of Euripides. The Athenians themselves did not neglect to do honour to their great poet after his death, for Pausanias makes mention of a statue to him that stood in the theatre of Athens.

Euripides made it a chief aim to awaken the tender emotions. 'He knew,' says one critic, 'the nature of the passions, and had the art of inventing situations in which they could have their full play. Withal he has an elegiac tone, which seldom or never falls of its effect. Most of his characters were once in the enjoyment of distinguished prosperity, and the retrospect, in their present situation, checks the violence of the passions, and lowers them to the tone of lamentation. For this reason, in his tragedies the passions are breathed forth in soft complaints, rather than raised to a lofty height; for the same reason he is so rich in moral sentences and philosophical declamations, as his personages have always coolness enough to reflect on their situation. Euripides knew well what was suited to produce an effect at the

moment. The times of boldness, when *Æschylus* wrote, were past, and the power of the state was beginning gradually to sink. The pathetic manner of Euripides then became popular.' Various faults may be found with his loose plan, his often unintelligible changes of character, his superfluous choruses, and sometimes, too, his subject; but he stands pre-eminent in true, natural expression of the passions, in interesting situations, original groupings of character, and varied knowledge of human nature. He is a master, too, in the art of managing the dialogue, in adapting the speeches and answers to the character, the sex, and station, the known or private views, the present disposition of the speaker, and the necessity of the moment, in short, to all that gives distinctness and individuality to a person. There is, too, a certain tenderness and softness diffused over his writings, which cannot fail to please the mind. He has been often called the *woman-hater*; but this seems to be rather a random charge, and was made probably on account of his many severe strictures on the follies of the female sex. We meet, however, in his works lofty and tender delineations of female character, and his sensibility to the nobler charms of female purity and virtue cannot be denied.

The number of tragedies composed by Euripides is stated by one authority to be seventy-five, of which only five are said to have gained him the prize; according to another authority the total number of his tragedies reached ninety-two, fifteen of which gained him the prize. His extant plays amount to eighteen, or nineteen if the *Rhesus* be included in the number, as it is by some scholars, although others reject it as spurious. The following are the extant plays of Euripides:—*Alcestis*, *Medea*, *Hippolytus*, *Coronifer*, *Hecuba*, *Heraclides*, *Suppliants*, *Ion*, *Hercules Furens*, *Andromache*, *Troades*, *Electra*, *Helena*, *Iphigenia in Tauride*, *Orestes*, *Phenissæ*, *Bacchæ*, *Iphigenia in Aulide*, and *Cyclops*. The most celebrated editions of Euripides are those of Paul Stephanus (Paris, 1602, two vols.), of Barnes (Cambridge, 1694, folio), of Musgrave (Oxford, 1778, four vols. 4to), of Morus and Beck (Leipzig, 1778–88, 4to), and of Augustus Matthiæ (Leipzig, 1813–29, nine vols.; a tenth vol., published in 1837, contains an index and the Vatican Scholia on the *Troades* and the *Rhesus*); a very good edition is that of Paley in the *Bibliotheca Classica* (three vols.). A lexicon to Euripides has been prepared by Constantine and Bernhard Matthiæ (Leipzig, 1841). Valkenaer, Brunck, Porson, Markland, &c., have devoted themselves to the illustration of single tragedies. The works of Euripides have been translated into verse by R. Potter, and by A. S. Way (1894–98); into prose by E. P. Coleridge.

EUROCLYDON, a tempestuous wind that frequently blows in the Levant, and which was the occasion of the disastrous shipwreck of the vessel in which St. Paul sailed, as narrated in *Acts* xxvii. 14–44. In the form in which the word is found in the received version it must be taken as made up of the two Greek words, *euros*, the east or rather south-east wind, and *clýdon*, a wave. But the word used for it in the Vulgate is *Euro-aquilo*, a Latin compound signifying a north-east wind; and some of the best MSS. have the reading *Euraklýdon* instead of *Euroclydon*, which is accepted by some as the preferable reading. Even if *Euroclydon* be the true reading, this form may, as Dean Alford suggested, have arisen from a natural attempt of the Greek sailors who were familiar with the Latin term *Euroaquilo*, as applied to this wind, to make it intelligible to themselves by forming a Greek compound to imitate it. In any case, whatever may have been the true form of the word, it was applied, as is indeed evident from the narrative in the *Acts*, to a north-east or north-

north-east, and not an east or south-east wind. The wind is represented as blowing from Crete (not 'against it,' that is, the ship, as in the received version of Acts xxvii. 14), while the vessel which contained Paul was coasting under the south shore of the island, and the course taken by the vessel is just that which would have been taken by one driven by a north-east wind. What renders this still more certain is that exactly such a wind is described by sailors of the present day as prevalent at certain seasons (especially in early spring) in the Mediterranean. The name by which the wind is now known is *Gregalia*.

EUROPA, in mythology, the daughter of Agenor, king of the Phœnicians, and the nymph Melia, or Telephassa, and the sister of Cadmus. The fable relates that one of Hēra's attendants stole a paint-box from the toilet of her mistress, and gave it to Europa. Her native beauty, heightened by this means, won the love of Zeus, who, in order to possess her, changed himself into a white bull, and appeared in this shape on the shores of the sea, where she was strolling with her companions. Attracted by the beauty and gentleness of the animal, she even ventured to mount upon his back, when he immediately plunged into the sea with his lovely prize, and swam to the island of Crete. Here he transformed himself into a beautiful youth, and had by her Minos, Sarpedon, and Rhadamanthus. She afterwards married Asterius, king of Crete, who, being childless, adopted her three sons. The continent of Europe was believed to have received its name from this princess.

EUROPE, the smallest of the great divisions of our globe, but distinguished above the rest by the character of its population, the superior cultivation of the soil, and the flourishing condition of arts, sciences, industry, and commerce, the multitude of large and well-built cities, and its power and influence over the other parts of the world.

History.—Of the origin of its name and its inhabitants history furnishes no certain account. The name first occurs in one of the so-called Homeric hymns. Probably the first inhabitants emigrated from Asia, but perhaps they may have come from North Africa. The first great advances in civilization were made in south-eastern Europe, say from B.C. 1500 to 1000. Here appeared the Hellenes, who outstripped the civilizations of Asia and Africa. The most flourishing period of that nation, commonly called the Greeks, was about 430 B.C. Equally distinguished in action and speculation, adorned by the arts and sciences, rich in the noblest productions of cultivated minds, it will remain an object of admiration as long as civilization endures. But with the dissolution of Alexander's empire, which had been raised on the ruins of Grecian freedom, Greece sank into significance.

At the same time, another nation was rising in Italy, the Romans, who appeared, indeed, at an earlier period, but made no figure in history till they had become masters of Italy, and had proved victorious in their struggle with the Carthaginians. From that period their power began to extend over all Europe. They subdued the divided Greeks, and transplanted their arts and refinement to the Italian soil. By the progress of the Roman arms Spain, Portugal, France, the coast of England, Belgium, Helvetia, the part of Germany between the Danube and the Alps, the Hungarian provinces (then called Pannonia, Illyria, and Dacia), became known, and received the Roman manners, language, and refinement. Agriculture was introduced, and flourishing cities rose among the wandering nomades. The Christian religion, which spread throughout the wide Roman Empire, was also a powerful instrument in the civilization of most of the European nations. Germany alone resisted the

overwhelming power of Rome, and thereby prevented the spreading of Roman civilization in the north of Europe, which still remained unknown in history.

With the fall of the Roman Empire, occasioned chiefly by its separation into the Eastern and Western empires, a great change in the political constitution of Europe was produced, by the universal emigration of the northern nations. These nations poured down upon the beautiful and cultivated countries of the Roman Empire, now in the weakness of decline, and Roman art and science were obliged to give place to the barbarity, the deep ignorance, and the superstition of the middle ages. The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. The empire of the Franks was enlarged, under Charlemagne, to such an extent, that the kingdoms of France, Germany, Italy, Burgundy, Lorraine, and Navarre were afterwards formed out of it. About this time the northern and eastern nations of Europe began to exert an influence in the affairs of the world. The Slaves, or Slavonians, founded kingdoms in Bohemia, Poland, Russia, and the north of Germany; the Magyars appeared in Hungary, and the Normans agitated all Europe. The power of the popes was now becoming more and more felt in Europe, and was carried to its highest pitch by Gregory VII. and Innocent III. The Crusades, which lasted from the end of the eleventh till near the end of the thirteenth century, tended greatly to aid the popes in acquiring the authority in Europe at which they aimed; but they had also the effect of forming a middle class, of leading the peasants gradually to throw off the chains of bondage, and of introducing the arts and sciences through the Arabs and Greeks into Europe.

The revival of letters, by the Greeks fleeing from Constantinople, gave an entirely new impulse to Europe. The establishment of universities, the invention of printing, and the Reformation, served to cherish and develop these seeds of improvement. The feudal contests, the struggle of privileges, led eventually to the acknowledgment and establishment of the rights of the individual. Out of the chaos of the middle ages arose the states of Germany, France, Spain, Portugal, England, Scotland, Switzerland, the Italian powers, Hungary, Bohemia, Poland, Denmark, Sweden, Norway, and Russia. By the capture of Constantinople (1453) the Turks, with their fanatical military despotism, became a European power. Austria, Holland, Prussia, Belgium, and Greece were subsequently added to the number of European states. The attempts of Charles V. and Louis XIV. to become masters of Europe failed; and in the beginning of the present century Napoleon conceived the project of forming, from the European states, a universal monarchy, pursued it for ten years, and failed also. Since the formation of the states of Europe the following have disappeared from the list of independent powers:—Hungary, Poland, Scotland, Bohemia, the minor Italian states; and the various states of Germany, with the exclusion of Austria, have been formed into the German Empire, under the leadership of Prussia.

Description.—Europe is bounded on the w. by the Atlantic, on the n. by the Arctic Ocean; on the e. it is separated from Africa by the Strait of Gibraltar and the Mediterranean, which is connected, with the Sea of Marmara or Propontis by the strait called the Dardanelles or Hellespont, and the Sea of Marmara, again, is joined on the s.e. by a similar strait—the Bosphorus—to the Black Sea, or Euxine. The Dardanelles and Bosphorus, with the intervening sea, divide Europe from the adjacent shores of Asia Minor.

To the east of the Black Sea the Caucasus range is now usually regarded as forming the southern boundary of Europe; and the Caspian Sea, the Ural River, and Ural Mountains, are usually held to form the eastern boundary. The most northern point of Europe, on the mainland, is Cape Nordkyn in Lapland, in lat. $71^{\circ} 6'$; North Cape, on the island of Mageroe, lies about 4 miles further north. The most southern points of the continent are Punta da Tarifa, lat. 36° , in the Strait of Gibraltar, and Cape Matapan, lat. $36^{\circ} 17'$, which terminates the Morea. The island of Crete, or Candia, reaches a little south of 35° . On the west, Cape Finisterre (coast of Spain) is in lon. $9^{\circ} 27' \text{ w.}$; Cape Roca (Portugal), in lon. $9^{\circ} 28' \text{ w.}$; while Ekaterinburg in the Ural Mountains lies in lon. $60^{\circ} 36' \text{ E.}$ Thus Europe may be said to extend, in round numbers, through 35 degrees of latitude, and 70 of longitude. From Cape Matapan to North Cape is a direct distance of 2400 miles; from Cape St. Vincent to Ekaterinburg, N.E. by E., 3400 miles. Owing to the irregularity of the outline of the continent of Europe and its separation into peninsulas, its area, notwithstanding its considerable length and breadth between the extreme points E. and W., and N. and S., does not exceed 3,800,000 square miles.

Europe is remarkably well watered, although its rivers have not so long a course, nor such large cataraacts, as those in other parts of the globe, particularly in America. The principal rivers are the Ebro, the Rhone, and the Po, running into the Mediterranean; the Danube, the Dnieper, and the Dniester, into the Black Sea; the Don, into the Sea of Azov; the Volga, into the Caspian; the Dwina, into the Arctic Ocean; another Dwina or Duna, the Vistula, and the Oder, into the Baltic; the Elbe, Weser, and Rhine, into the North Sea; the Seine, into the English Channel; the Loire and Garonne, the Douro and Tagus, the Guadiana and Guadalquivir, into the Atlantic. The Volga and Danube are the longest. Of its numerous lakes, the largest, which, however, bear no comparison with the North American, are in the north of Europe; viz., in Russia, Lakes Ladoga (the largest in Europe), Onega and Peipus; in Sweden, Lakes Malär, Wener, and Wetter. On the borders of Germany and Switzerland is Lake Constance; on the borders of Italy and Switzerland is the Lake of Geneva (Lake Lemán); Hungary has the Platten See.

A great part of Europe is mountainous; the southern more so than the northern. The most elevated region is Switzerland, from which there is a descent which terminates on the side of the North Sea and the Baltic in low plains. The lowest and most level parts are Holland and Northern Germany, Denmark, Russia, and Prussia. The highest mountains are the Alps, in Switzerland and Italy, which spread from those countries in various directions, extend westwardly into France, and are connected by the Cévennes with the Pyrenees, which separate France from Spain. One chain of the Alps stretches south towards the Mediterranean; then, taking an easterly course, runs through Italy under the name of the Apennines. Several branches run eastward from the Alps through the south of Germany as far as the Turkish Provinces. Another chain, the Jura, runs to the north, and separates Switzerland from France. In the east of Europe are the Carpathian Mountains, which, on one side, meet the Sudetic range, and on the other the Mountains of Turkey in Europe. Mont Blanc, in Savoy, one of the Alps, which rises to the height of 15,732 feet above the level of the sea, is usually said to be the highest mountain in Europe; but if the Caucasus range be taken as forming the boundary in the south-east between Europe and Asia, Mount Elburz, which

rises to the height of 18,514 feet above the level of the sea, must be considered as the highest. It is a fact worthy of notice, that none of the volcanoes of Europe are to be found in any of the great chains of mountains which have just been enumerated. The only one on the continent is Vesuvius, and this is too much detached to be considered as properly forming one of the Apennines. *Ætna*, in the island of Sicily, rising to the height of 10,874 feet above the level of the sea, is the largest European volcano. The Lipari Islands, anciently called the *Æolian*, a few miles to the north of Sicily, bear evident marks of a volcanic origin; and in several of them subterranean fires are still in operation. The volcano of Stromboli is in almost incessant activity, and differs, in this respect, from every other with which we are acquainted. The Azores, in the Atlantic Ocean, are doubtless indebted for their formation to the same circumstance as the Lipari Islands; and, indeed, new rocks have risen from the sea in their vicinity within a recent period. An eruption took place at St. George during the present century. Volcanic phenomena are also seen in the Grecian Archipelago, and a violent eruption took place at the island of Santorin in 1866. Iceland, too, presents the most abundant tokens of the presence of volcanic fire, and has often suffered under its devastations. Mount Hecla is the most noted, though not the only source of the eruptions on this island.

Geology and Mineral Products.—From a geological point of view Europe presents certain general characteristics which can here be only briefly indicated. The crystalline and metamorphic formations are represented in Lapland, Sweden, Finland, Norway, the Highlands of Scotland, the western part of the principality of Wales, the half of Ireland, the counties of Devon and Cornwall in England, Brittany and the west of Normandy in France, the most elevated ranges of the Alps, Corsica, the larger part of Sardinia, the shores of Tuscany, Calabria, the north-east of Sicily, Bohemia, Carinthia, Styria, parts of Hungary and Transylvania, half of the east of Turkey and Greece, and the middle chain of the Caucasus Mountains. To the secondary formations belong—the Lowlands of Scotland, half of the central part of Ireland, the north-east, the centre, and the greater part of the southern counties of England, nearly all Western France and Germany, the most elevated summits of the Pyrenees, the regions stretching over both slopes of the Alps, Central and Southern Italy, the north of Sicily, Istria, Dalmatia, half of Western Turkey and Greece, Galicia, large strips along the course of the Volga, and the northern slope of the Caucasus. Finally, the greater part of Russia, Poland, Prussia, all Denmark, the north-west of Germany, Holland, a large part of Belgium, the western counties of England, the basins of the Seine, Loire, Garonne, and Rhone in France, the northern part of Switzerland, the plains of Lombardy, Hungary, Wallachia, and Bulgaria, nearly the whole of Apulia, and lastly southern and western Sicily belong to the tertiary formations. Granite, gneiss, syenite, and the calcareous rocks, frequently mixed with mica and slate, are the principal rocks of Europe. Iron, salt, coal, copper, tin, lead, mercury, silver, zinc, cobalt, arsenic, nickel, &c., are found in various parts of Europe, and some of them in great abundance, but gold is very rare in this quarter of the globe. The north of Italy, and the islands of the Archipelago, yield the best kinds of marble known. Sulphur, vitriol, ammonia, nitre, serpentine, and porcelain clay abound in several parts of Europe.

Climate, Vegetation, &c.—Europe enjoys the great advantage of lying almost wholly within the temperate zone. A small portion of it indeed, comprising Lap-

land and the north coast of Russia, does extend beyond the Arctic circle, but it nowhere reaches to the line of perpetual congelation. On the other hand the most southern point of Europe does not reach within 12° of the Tropic, nor even attain a zone where snow is a rare phenomenon. Another great advantage is the great extent of its maritime boundaries, the European continent being, as already stated, a great peninsula, again divided into several peninsulas. This frequent mixture of sea and land tends to diffuse over the latter the equable temperature of the ocean. It is also the means of conveying to the land an immense quantity of vapour, which, falling in rain, furnishes to the atmosphere an accession of heat. It is well known that the west coasts are in general more warm and humid than those that face the east. Now this difference of climate is due wholly to the difference between the ruling winds. The south-west wind, which is in reality the warm equatorial current of the atmosphere, flowing first north but gradually diverted towards the east by its greater velocity as compared with that of the regions it traverses, is the predominating wind of Western Europe. In Ireland the south-west wind, warm and humid, prevails during nine months of the year; on the Continent, its duration, strength, and temperature, decline uniformly towards the east. At St. Petersburg it is still the prevalent wind, but further east it gives way to the cold and dry north-east wind, which is in reality the polar current of the atmosphere, flowing originally south, but diverted westward by its smaller velocity as compared with that of the regions it traverses. From this it will be evident that the heat and moisture of the equatorial zone are continually flowing into the atmosphere of Europe. But this effect is greatly heightened by an oceanic current. The equatorial current of the ocean runs west; but being checked by the American continent it turns north, flows round the Gulf of Mexico, and then, under the name of the Gulf-stream, runs at a little distance from the coasts of the United States, and passing south of Newfoundland, falls with a relatively high temperature chiefly on the shores of Ireland, Scotland, and Norway. At the same time the north shores of Europe are guarded from accumulation of ice by fortunate accidents of structure. The great projection of the continent west of the Obi, and the position of Novaya Zemlia, stretching forward to lat. 77°, screen Europe effectually from the ice formed on the north shores of Siberia. This ice, when it breaks up, drifts to Greenland, the east coasts of which are never open, while the west shores of Norway in the same latitude are never closed. Thus it appears, that many circumstances concur to favour Europe generally with a peculiarly genial climate, in which the vicissitudes of season are felt without their rigour, and the luxuriance of nature is so far subdued as never to overpower the efforts of industry.

With respect to the vegetable kingdom, Europe may be conveniently divided into four zones. The first or most northern is that of fir and birch. This may be subdivided into the zones of lichen, birch, and fir. The heights inaccessible to other vegetation up to the borders of perpetual snow are occupied by lichens, the most valuable of which are the reindeer-moss and the Iceland-moss. The birch reaches almost to the North Cape; the fir ceases a degree further south. The cultivation of grain extends further in these rude latitudes than might be at first supposed. Barley ripens even under the 70th parallel; wheat ceases at 64° in Norway, 62° in Sweden. In the country of the Samoyedes, in East Russia, the limit of barley is in about 67°. Within this zone, the south limit of which extends from lat. 64° in Norway to lat. 62° in

Russia, agriculture has little importance, its inhabitants being chiefly occupied with the care of reindeer or cattle, and in fishing. The next zone, which may be called that of the oak and beech, and cereal produce, extends from the limit above-mentioned to the 48th parallel. The Alps, though beyond the limit, by reason of their elevation belong to this zone, in the moister parts of which cattle husbandry has been brought to perfection. Next we find the zone of the chestnut and vine, occupying the space between the 48th parallel and the mountain chains of South Europe. Here the oak still flourishes; but the pine species become rare. Rye, which characterizes the preceding zone, on the Continent, gives way to wheat, and in the south portion of it to maize also. The fourth zone, comprehending the south peninsula, is that of the olive and evergreen woods. The orange flourishes in the south portion of it, and rice is cultivated in a few spots, in North Italy and East Spain. The deciduous oak here gives place to the evergreen and cork oaks, with edible acorns. The lines which define the region favourable to the growth of each plant generally incline south towards the east; but it is otherwise with the vine, olive, and a few other plants within certain limits. The cultivation of the vine begins on the coast of France, in lat. 48°, passes north of Paris, in lat. 49°, and goes still further north in Germany, where it reaches its north limit; it is still, however, carried on with success on the Volga, in lat. 50°.

The zoology of Europe offers little for remark. The reindeer and polar bears are peculiar to the north. The south alone has lizards and serpents. In the forests of Poland and Lithuania the urus or bison, a species of wild ox, is still occasionally met with. Bears and wolves still inhabit the forests and mountains; but in general cultivation and population have expelled wild animals. The domesticated animals are nearly the same throughout. The ass and mule lose their size and beauty north of the Pyrenees and Alps. A few camels are bred in the neighbourhood of Siena, in Italy, in which country also buffaloes are used for draught. The Mediterranean Sea has many species of fish, but no great fishery; the north seas, on the other hand, are annually filled with countless shoals of a few species, chiefly the herring, mackerel, cod, and salmon. The fisheries thus arising are intrinsically valuable, and have unquestionably exercised a great influence on the early history and advancement of north-western Europe.

Ethnography and Language.—Europe is occupied by many different races, wholly distinct or very remotely connected. The Celts once possessed the west of Europe, from the Alps to the British Islands. The names Alps and Albion, it may be observed, are derived from the same Celtic root, *alb*, white. The Celtic language, at the present day, is spoken only in the Scotch Highlands and the Hebrides (Gaelic), in some parts of Ireland (Erse), in Wales (Cymric), and in Brittany (Armorican). In Spain, as in Britain, the Celts were driven to the west side; the east shores, the Pyrenees, and part of Aquitania were held by the Iberians, of whom the Basques are now the representatives. Their language, the Eskuara, has no discoverable affinity with any other; and the Basques are the only European race who cannot be traced into Asia. Next to the Celtic comes the Teutonic race, comprehending the Germanic and the Scandinavian branches. The former includes the Germans, the Dutch, and the English, speaking each their own tongue, and the Goths, who have long since disappeared as a separate people. The Scandinavians, Danes and Norwegians chiefly, colonized Iceland and the Faroe Islands, Shetland, Orkney, &c., and sent considerable colonies to England also; and traces of

their presence in Ireland may be discerned even in Ptolemy's map of that island, A.D. 150. The literature of this race goes back to pagan times, and is extremely abundant. To the east, in general, of the Teutonic race, though sometimes mixed with it, come the Slavonians, that is, the Poles, the Czechs or Bohemians, Esthonians, the Servians, Croatians, about one-third of the population of Hungary, and the Russians. The Wends or Veneti, formerly a powerful nation on the south shores of the Baltic, but now absorbed in the German name, were of this race. An offshoot of the same stock penetrated to the head of the Adriatic Sea, and founded Venice. In the south and south-east of Europe are the offspring of the Pelasgian stock, speaking the Greek and Latin, which latter absorbed the Etruscan and other languages of ancient Italy. Greek was the language not merely of the Grecian peninsula, but of all the islands and Asiatic shores of the Ægean Sea. Modern Greek or Romaic is spoken within a comparatively limited range, and differs from the ancient tongue chiefly in having lost many grammatical inflexions; hence it is called Aplo-Hellenic or Simple Greek. Modern literary Greek, however, preserves many inflexions which have been lost to the popular speech. The Albanians on the west side of the Grecian peninsula are probably sprung from the ancient Illyrian and Dacian population of the Illyrian mountains. At the present day the language of the Skipetars (as they call themselves) contains much Slavonic and other foreign elements. The Teutonic, Slavonic, Greek, and Latin (with the modern tongues derived from them) all belong to what is called the Indo-European or Aryan family of languages. Turkish tribes occupied the steppes north of the Black Sea, probably at an early age. At present the Bashkirs in the South Ural are of Turkish race, to which belong also the Tatars (Tartars) of Kasan, those of

the Crimea, and the Nogays on the Don. The Ottoman or Othman Turks (so named from their early Sultan, Othman or Osman), after being settled for ages in Asia Minor, at length took Constantinople in 1453, and established their empire in Europe. Previous to this event a body of Turcomans had forced their way into Macedonia, where their descendants still remain. The fishing and hunting tribes of North Siberia also took part in this west movement, and the Finns, advancing from the Obi, settled themselves in the countries now called Lapland and Finland. Higher up, from the banks of the Irish, other hordes of the same nation, mingled with and led by Turks and Mongols, poured down on the valley of the Danube in the ninth century, and founded the Kingdom of Hungary. The language of the Magyars, as the Hungarians call themselves, has not yet lost all resemblance to that of the Ostiaks on the Obi, though it is most nearly related to the Finnish. The inconvenience arising from diversity of speech is much diminished in Europe by the great predominance of the languages of the Indo-European family, which are spoken by nine-tenths of the whole population; the Teutonic group numbering about 120,000,000; the Slavonic, 116,000,000; the Latin, 105,000,000. The total population is about 393,000,000. (See ETHNOLOGY.)

Religion.—The prevailing religion is the Christian, embracing the Roman Catholic Church, which is the most numerous, the various sects of Protestants (Lutheran, Calvinistic, Anglican, Methodist, Baptists, Presbyterians, Mennonites, Quakers, Unitarians, Moravians, &c.), and the Greek Church. A part of the inhabitants profess the Jewish, a part the Mohammedan religion. Among the Laplanders and Samoides there are also some heathens.

Political Divisions.—The following are at present the states of Europe:—

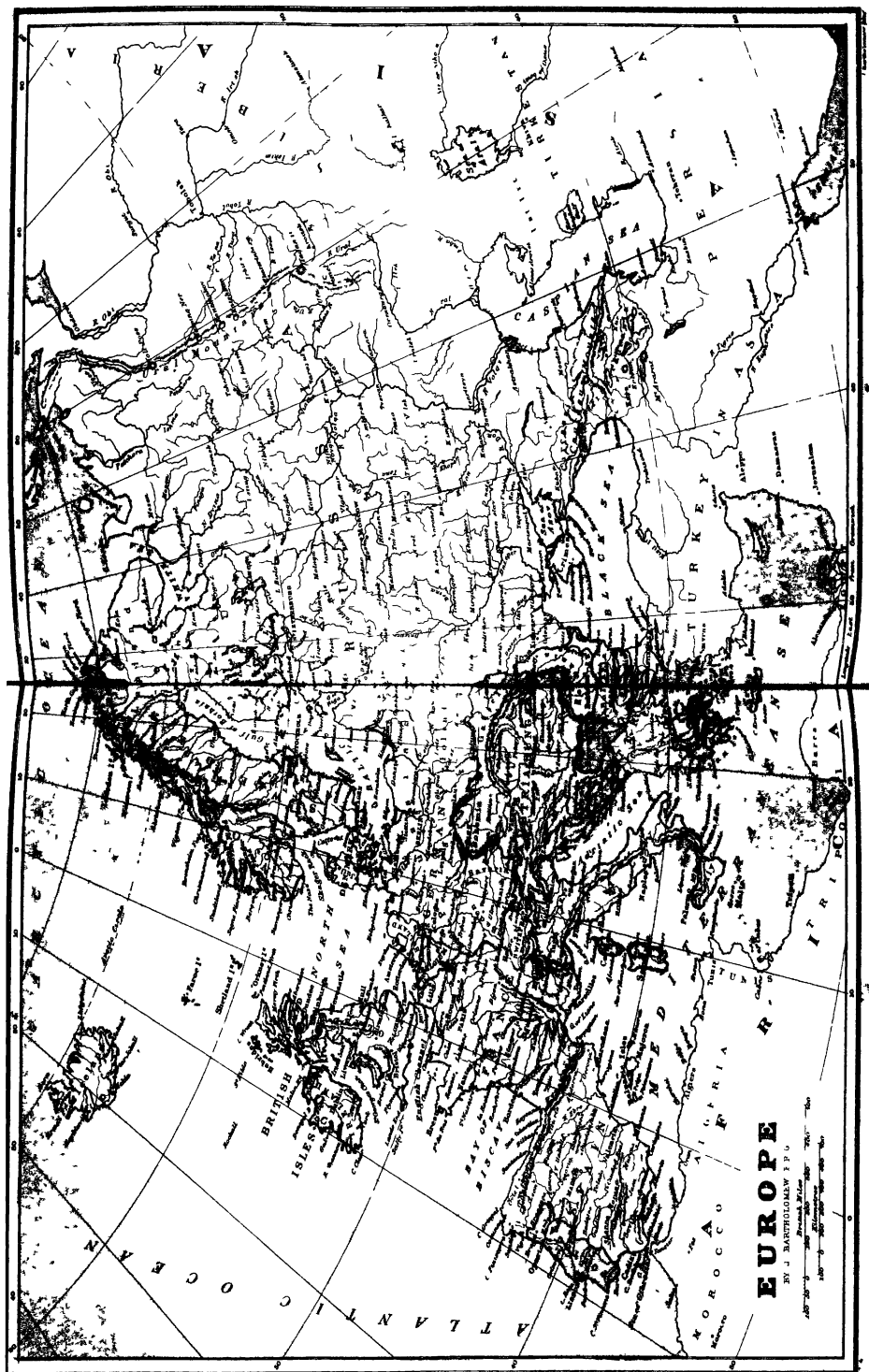
STATES	Area in Eng. sq miles	Population	Designation	Capital
Andorra.....	175	6,000	Republic.....	Andorra la Vieja.
Austria-Hungary.....	240,942	45,858,000	Empire.....	Vienna.
Liechtenstein.....	70	9,500	Principality.....	Liechtenstein.
Bosnia, Herzegovina, &c.,	23,202	1,568,000	Occupied by Austria, ..	Bosna-Sera.
Belgium.....	11,373	6,088,000	Kingdom.....	Brussels.
Denmark.....	14,775	2,449,500	Kingdom.....	Copenhagen.
Faroe Islands and Iceland,	40,270	86,000		
France.....	204,092	38,641,000	Republic.....	Paris.
Germany.....	208,830	56,367,000	Empire.....	Berlin.
Great Britain and Ireland,	120,979	41,805,000	Kingdom.....	London.
European possessions,	119	211,000		
Greece.....	25,014	2,434,000	Kingdom.....	Athens.
Holland.....	12,048	5,180,000	Kingdom.....	Amsterdam.
Italy.....	110,646	32,450,000	Kingdom.....	Rome.
Luxemburg.....	998	238,500	Grand-duchy.....	Luxemburg.
Monaco.....	8	13,000	Principality.....	Monaco.
Montenegro.....	3,630	228,000	Principality.....	Cetigné.
Portugal.....	86,038	5,429,000	Kingdom.....	Lisbon.
Roumania.....	48,307	5,912,500	Kingdom.....	Bucharest.
Russia and Poland.....	1,961,361	108,671,000	Empire.....	St Petersburg.
Finland.....	144,255	2,673,000	Grand-duchy.....	Helsingfors.
San Marino.....	82	4,500	Republic.....	San Marino.
Serbia.....	19,050	2,494,000	Kingdom.....	Belgrade.
Spain.....	197,057	18,089,500	Kingdom.....	Madrid.
Sweden and Norway—			Kingdom.....	
Sweden.....	172,876	5,136,500		Stockholm.
Norway.....	124,445	2,240,000		Christiania.
Switzerland.....	15,976	3,315,500	Confederative Republic,	Berne.
Turkey.....	66,070	6,100,000	Empire.....	Constantinople.
Bulgaria.....	24,380	2,641,000	Principality.....	Sofia.
Eastern Roumelia.....	13,700	1,092,000	Joined to Bulgaria,....	Philippopolis.

EUROTAS, a river of southern Greece (Peloponnesus), now called the *Iris* and *Niris* in the upper, and the *Barilipotamo* (King's River) in the lower part of its course, flows in a southerly direction through the valley between the ranges of Taygetus and Parion, and enters the upper part of the Gulf of Kolokythis. Its banks and the dry parts of its bed are overgrown with a profusion of reeds, and

hence the well-known appellation of the 'reedy Eurotas' given to it by the ancient poets.

EURYALUS.—1. One of the Greek heroes of the siege of Troy.—2. One of the companions of Æneas, famous for his friendship with Nisus, with whom he was killed, after having forced his way with him into the enemy's camp.

EURYDICE. Among the many women of an-



EURYNOME, here this name, the most celebrated is that of Orpheus, who died by the bite of a serpent. His husband, inconsolable for her loss, descended to the lower world, and, by the charms of his song, moved the infernal deities to grant him permission to bring her back. This they granted, on condition that he would not look round upon her till he had reached the upper world. Forgetting his promise, he looked back, and lost her for ever. This story has often formed a fine subject for poets—as for Virgil in the *Georgics* (book iv.), and for Pope in his *Ode on St. Cecilia's Day*.

EURYNOME, the daughter of Oceanus; according to Hesiod, the mother of the Graces (which see).

EUSEBIUS, surnamed *Pamphilus*, the father of ecclesiastical history, was born in Palestine about 265 A.D., and died about 340. About 315 he was appointed Bishop of Caesarea. He was at first opposed to the Arians, but afterwards became their advocate, and with them condemned the doctrines of Athanasius.

His ecclesiastical history, written, like his other works, in Greek, is contained in ten books, and extends from the birth of Christ to 324. The best editions are that of Valesius (Paris, 1659-73, fol.), and that of Reading (Cambridge, 1720, fol.). It has been translated into English by Parker (1703), Cater (1736), and Dalrymple (1778). Of his *Chronicon*, with the exception of some fragments of the original, we have only an Armenian translation and the Latin version of Jerome. Besides these there are yet extant fifteen books of his *Preparatio Evangelica*, which is particularly valuable for the extracts it contains from lost philosophical works. Of the twenty books of his *Demonstratio Evangelica*, in which he shows the superiority of Christianity to Judaism, we have only ten imperfectly preserved; and, finally, a life, or rather eulogium, of Constantine. Notices of his life may be found in the above-quoted edition of Valesius. His honesty as an historian was fiercely attacked by Gibbon; and although other writers have defended him against the charge of dishonesty, Eusebius himself makes admissions that throw suspicion on the credibility of his history.

EUSTACHIO, BARTOLOMEO, a physician and anatomist, born at San Severino, in the march of Ancona, soon after 1500; died at Rome about 1574. He studied Latin, Greek, and Arabic at Rome, and devoted himself to the various departments of medical science, more particularly those which relate to the structure of the human body, and was made physician to the Cardinals Carlo Borromeo and Giulio della Rovera, he was also appointed professor in the Collegio della Sapienza at Rome. There is hardly any part of anatomical science which he did not enrich by profound researches or important discoveries. Some of the parts discovered by him have received their names from him: thus the canal that unites the internal ear with the back part of the mouth is called the *eustachian tube*; so also the *eustachian valve* of the heart. Among his works are his *Tabulae Anatomicae*, consisting of plates illustrative of the human body, engraved in 1552, but not published till 1714 (Rome, fol.). The text of this work has never been found. Albinus published an excellent commentary on these tables (Leyden, 1744, fol.). Another of his works, *De Anatomicorum Controversiis*, is also lost. Besides these we have many other valuable works by him. Boerhaave published an edition of them at Leyden, 1707, which was reprinted at Delft, 1736.

EUSTATIUS, Sr., one of the Leeward Islands, 15 miles south-east of Saba, and 11 north-west of St. Christopher's, is a huge rock, rising out of the waves, in the form of a pyramid, 29 miles in circumference. Sugar, cotton, and maize are raised here;

but the principal production is tobacco, which is cultivated on the sides of the pyramid to its very top. There is but one landing-place, and that, though difficult of access, is strongly fortified. The number of inhabitants, which amounted in 1780 to 25,000, has dwindled down to about 1900. The Dutch occupied without colonizing this island about the year 1600. The first Dutch settlement was made in 1635. In the year 1665 it was captured by an English expedition. After being in the hands both of the English and the French at different times, its possession was finally secured to Holland by the Peace of Ryswick in 1697. In 1781 a large naval and military force, under Admiral Rodney, compelled the inhabitants, who were incapable of defence, to submit at discretion. The English commanders, under the pretence that the people of the island had supplied the United States of America with naval stores, confiscated all private property, and at one blow reduced the unfortunate inhabitants to poverty. In the same year, however, the island was retaken by a small body of French troops under the command of the Marquis de Bouillé. St. Eustatius was again attacked by the British in 1809, and compelled to submit; but in 1814 the Dutch government was restored.

EUTERPE, one of the Muses, considered as presiding over lyric poetry, because the invention of the flute is ascribed to her. She is usually represented as a virgin crowned with flowers, having a flute in her hand, or with various instruments about her. As her name denotes, she is the inspirer of pleasure. See **MUSES**.

EUTROPIUS, FLAVIUS, a Latin historian, who, as he himself informs us, bore arms under the Emperor Julian. The place of his birth and his history are unknown to us. He flourished about 360 A.D. His abridgment of the history of Rome (*Breviarium Historiae Romanae*), written in a perspicuous style, reaches from the foundation of the city to the time of the Emperor Valens, to whom it is dedicated. The most esteemed editions are those of Haverkamp (Leyden, 1729), Verheik (Leyden, 1762, two vols.), Tzschucke (Leipzig, 1804), and Droyen (Berlin, 1878).

EUTYCHES, a celebrated heresiarch who lived during the first half of the fifth century. He was archimandrite or superior of a monastery near Constantinople, and was an ardent friend of Nestorianism, which taught that there were two distinct persons in Jesus Christ; but he himself fell into the opposite extreme, and declared that after the incarnation there was only a divine nature in Christ under the appearance of a human body. For holding this doctrine he was excommunicated by the Council of Constantinople in 448, but the sentence was reversed by what is called the 'Robber Council' of Ephesus in 449. The two parties now become only more embittered against each other, and carried on the contest with greater obstinacy, each in turn hurling anathemas and sentences of excommunication against the other. At last the Council of Chalcedon in 451 condemned both the doctrines of Eutyches and those of the Nestorians. Eutyches, expelled from his monastery, disappeared from the scene; but his sect, under the name of the Monophysites, continued to maintain itself in the East for a long time after, in spite of the persecutions of the church and the emperors. See **MONOPHYTES**.

EUXANTHIC ACID ($C_{10}H_{14}O_{10}$). In combination with magnesia it forms Indian yellow or purras. By extracting with water, and boiling the residue with hydrochloric acid, euxanthic acid deposits in groups of yellow needles on cooling. It is soluble in alcohol and ether, but sparingly in cold water. With metallic oxides it forms salts called *euxanthates*; these

with the alkalies and alkaline earths are soluble in water; the others are insoluble. They are almost all of a yellow colour. When the acid or baric euxanthate is heated, water and carbonic acid are liberated, and a neutral yellow crystalline body, euxanthone, is formed. Both the acid and euxanthone give chlorine and nitro-substitution compounds.

EUXENITE, a mineral of very complex composition, which contains the rare elements niobium, titanium, uranium, yttrium, cerium, lanthanum, along with calcium, magnesium, iron, and aluminium. It is met with at different localities in Norway, but is rare. It is sometimes crystallized, but more commonly massive, black with vitreous lustre. It is not acted on by acids, but is decomposed by acid sulphate of potassium.

EUXINE (*Pontus Euxinus*), the ancient name for the Black Sea.

EVANDER, the civilizer of Latium, the son, according to one account, of Hermes and an Arcadian nymph; according to another, of Echemus and Timandra. About sixty years before the Trojan war he was compelled to quit the town of Pallantium in Arcadia, some say in consequence of a civil strife, and others in consequence of having killed his father. He betook himself to Italy along with a colony of Pelasgians, defeated and slew Herilus, king of Præneste, established himself with his compatriots in Latium, and built, at the foot of the Palatine Hill, on the banks of the Tiber, a town, to which he gave the name of Pallantium. The Roman legends represent him as teaching the Latins the use of the alphabet, and the arts of agriculture and music, softening their fierce manners by the introduction of more humane laws, and introducing among them the worship of the Lycæan Pan, Heracles, Demeter, &c. In the *Æneid* Virgil brings his hero *Æneas* into connection with Evander, who gives him a favourable reception, and becomes his ally against the Latins. Divine honours were paid to Evander by the inhabitants of Pallantium in Arcadia.

EVANGELICAL, a word literally signifying 'pertaining to the gospel' (Greek, *euangelion*), and used in different senses. In one of its senses it is a term used to qualify certain doctrinal views, especially strong views on the question of the atonement, justification by faith, and allied doctrines. In this sense the word, when applied to a whole church, is in Scotland almost synonymous with orthodox. In England, on the other hand, the Evangelical or Low Church party is looked upon as extreme in its views, and is distinguished from the orthodox party, which holds the doctrines above specified in a more moderate form. When used in a less general sense something more is implied in the word. When we speak of an evangelical minister, for example, we mean not only that he is 'sound' in the faith, but that he exhibits peculiar attachment to sound doctrine and peculiar fervency in preaching it. So also when we speak of an evangelical sermon, such a one is meant as contains sound doctrine warmly set forth and inculcated. In another sense the term is applied in Germany to Protestants as distinguished from Roman Catholics, inasmuch as the former recognize no standard of faith except the writings of the evangelists and the other books of the Bible, and more especially to the national Protestant Church formed in Prussia in 1817 by a union of the Lutheran and Calvinistic churches. See **LUTHERAN REFORMED CHURCH**.

EVANGELICAL ALLIANCE, an association of members of the different sections of the Christian church, organized in London in 1846, the preparatory measures having been devised at a conference of friends of Christian union held in Liverpool in the previous year. The assembly at Liverpool was con-

vened by a Scottish circular addressed to the evangelical churches in England, Wales, and Ireland, signed by ministers and other office-bearers of the Free Church, United Secession, Relief, Reformed Presbyterian, Original Secession, Congregationalist, and Baptist churches. This preliminary meeting, which was crowned with success, was followed in 1846 by the meeting in London, when the Evangelical Alliance was formally instituted. At this meeting was adopted a doctrinal basis, which it had been the chief business of the Liverpool conference to discuss and arrange, and which is, in effect, the recognition by the members of the divine inspiration, authority, and sufficiency of the Holy Scriptures; the right of private judgment in their interpretation; the unity of the Godhead, and the Trinity of persons therein; the doctrine of human depravity by the fall; the incarnation, atonement, and intercession of the Son of God; justification by faith alone; the work of the Spirit; the immortality of the soul, the resurrection of the body, the final judgment of the world; the eternal blessedness of the righteous, and the eternal punishment of the wicked; the divine institution of the Christian ministry; and the obligation of baptism and the Lord's supper; it being understood that the summary of doctrines is not to be regarded as a creed or confession, but simply as distinguishing the class of persons whom it is desirable to embrace within the Alliance. The Alliance has held annual conferences at Manchester, Edinburgh, Bristol, Glasgow, Liverpool, &c., and has struck its roots deeply in every part of Britain.

EVANGELICAL ASSOCIATION, a religious sect founded in America about the beginning of this century by a Lutheran preacher called Charles Albrecht, who was born in Pennsylvania, 1759. In their form of doctrine and mode of worship they resemble the Methodists. In 1887 their numbers in the United States were about 183,000.

EVANGELICAL UNION, the name under which the sect familiarly known as the Morisonians, which took its rise in Scotland in 1840, organized itself as a separate church. The originator of the body was the Rev. James Morison, a minister of the United Secession Church at Kilmarnock, who taught doctrines which were considered to be at variance with those laid down in the Westminster Confession of Faith. His most distinctive doctrine was on the subject of the atonement, with regard to which he maintained that Christ died for all men without exception, and therefore it was the bounden duty of every human being to believe in his own personal salvation. Another of his doctrines was that man possessed the ability of exercising saving faith by his own unaided faculties, and irrespectively altogether of the Holy Spirit, and that therefore it was both unnecessary and unscriptural to pray for strength to enable us to believe. Election he admitted to be eternal, personal, and unconditional, but held that it came in the order of nature, not before, as Calvinists maintained, but after the purpose of atonement. For holding and proclaiming these sentiments Mr. Morison was suspended from the ministry of the United Secession Church. Three other ministers were ejected from the body on similar grounds. They then began actively to promulgate their views, and in a short time they succeeded in gaining a considerable number of supporters, a number of whom belonged to the Independent body. At length, in May, 1843, they formed themselves into a separate Christian denomination, under the name of the Evangelical Union. The views of the members had before this time undergone considerable modifications. They no longer believed in divine grace as special to believers, but maintained it to be common to all men, and capable

of being resisted and effectually overcome. They taught election to be unconditional, but in the foreknowledge of future faith.

In point of church government the Evangelical Union was an independent or congregational body. A conference was held yearly in Glasgow, which, however, exercised no judicial control over the pastors or congregations, but consulted for the general interests of the whole, managed the affairs of the Missions, &c. In 1896 most of the churches of the Evangelical Union united with the other Congregational churches in Scotland, the congregations then belonging to the body being about ninety in number.

EVANGELIST ISLANDS, or ISLANDS OF DI-RECTION, a group of four islands off the west coast of Patagonia, near the west entrance of the Strait of Magellan, to which they form an excellent guide. They are rugged and barren, and much frequented by seals and sea birds. With some other islands farther to the west they form a group known as the Twelve Apostles.

EVANGELISTS, the writers of the history, or doctrines, precepts, actions, life, and death of Christ; in particular, the four evangelists, or writers of the four gospels, St. Matthew, St. Mark, St. Luke, and St. John. The ancient symbols of these evangelists were: *a man's face* for St. Matthew, *a lion* for St. Mark, *an ox* for St. Luke, and *a flying eagle* for St. John. See the separate articles, also **GOSPEL**. In Ephesians iv. 11, St. Paul uses the word in a wider sense to describe a certain official of the early church whom he distinguishes from both the apostle or prophet and the pastor.

EVANS, MARIAN. See **ELIOT, GEORGE**.

EVANS, SIR GEORGE DE LAOY, a British general, was born at Moig in Ireland in 1787, and died in London, January 9, 1870. Joining the Indian army in 1806 as a volunteer, he received an ensigncy in the 22nd Regiment of Foot in 1807, in which year he took part in the war against Ameer Khan. In 1812 he joined the army of Wellington in the Peninsula, and was present at most of the principal battles and sieges of that war, throughout which he distinguished himself by his eagerness to join the most hazardous expeditions. In the beginning of 1814 he was sent to America, and at the battle of Bladensburg (August 24, 1814) had two horses shot under him. At the head of 100 men he forced the capitol at Washington. He was twice wounded before New Orleans in December, 1814, and was on that account sent home to England, where he recovered just in time to be able to join Wellington at Quatre-Bras and Waterloo. After the Peace of Paris, Evans retired into private life, from which he next emerged as a supporter of the reform agitation in the reign of William IV. In 1830 he was elected member for Rye, but lost his seat at the general election in the same year. In 1831 he was, however, again returned to Parliament for Rye; and in 1833 he was elected by Westminster, which he represented for many years. In 1835, the British government having permitted Spain to raise 10,000 troops in Britain to act against Don Carlos, Evans accepted the command of this force, which, although raised from the lowest classes of the population, he succeeded in converting into an army of excellent and well-disciplined soldiers, and was able to render splendid service against the Carlists. In 1837 he returned to England, and was made a Knight Commander of the Bath. In 1846 he was raised to the rank of major-general. At the outbreak of the Crimean war he was appointed to the command of the second division of the British army, and distinguished himself at the battle of the Alma, the siege of Sebastopol, and the battle of Inkermann, to

be present at which he rose from a sick-bed. For his services he received the thanks of the House of Commons, the Grand Cross of the Bath, and he had the cross of a grand officer of the Legion of Honour conferred on him by Napoleon III. He now resumed his seat in the House of Commons, in which, on every opportunity, he attacked the practice of selling commissions in the army.

EVANSVILLE, a town in the United States, in the state of Indiana, capital of the county of Vanderburg, on a height above the Ohio, 140 miles south-west of Indianapolis. It contains, besides churches and schools, public libraries, city hall, court-house, art gallery, a national marine hospital erected by the general government, a fine temperance hall, custom-house, &c. Coal and iron abound in the neighbourhood. It is an important railway and commercial centre, and has wool, leather, iron, flour, and other industries. The inhabitants include a large proportion of Germans. Pop. In 1870, 21,830; in 1880, 29,280; in 1890, 50,756; in 1900, 59,007.

EVAPORATION, the formation of vapour at the free surface of a liquid. Evaporation is distinguished from *ebullition*, or boiling, during which vapour is formed in large quantities within the liquid, or more frequently beneath the liquid at the surface of the containing vessel, and rises in bubbles to the free surface. When the surface of a liquid is exposed to a space that is either vacuum or filled with gases or vapours different in composition from that of the liquid in question, evaporation takes place. A portion of the liquid escapes in the gaseous form from the general mass, and, rising into the space, spreads through it according to the laws of diffusion of gases. Supposing the temperature of the space above the liquid to be uniform, the evaporation proceeds (provided there is a sufficient quantity of liquid) until the space is uniformly filled with vapour; and the whole quantity that rises into the space depends, for any particular liquid, solely on the dimensions of the space and on the temperature of it. The presence of other gases or vapours does not interfere with the action, except in making it slower than it would be were the space vacuum. A space thus filled with the maximum quantity of vapour corresponding to the temperature of it is said to be *saturated*. If the dimensions of the space be diminished, a portion of the vapour is forced to condense; if the temperature of the space falls, a portion of the vapour condenses also; while if the temperature of the space is increased, the dimensions remaining unchanged, the space ceases to be saturated, because the quantity of the vapour that corresponds to saturation is greater the higher the temperature. Consequently, if there is a supply of the liquid present, more of it will rise in vapour.—When there is not a sufficient quantity of liquid present to saturate the space completely, the whole of the liquid evaporates, and the vapour diffuses uniformly through the space. The space is then said to be non-saturated; if there is present one-half or a quarter of the maximum quantity of the vapour that the space could contain at the temperature, it is said to be half-saturated, or quarter-saturated. If under these circumstances the temperature of the space is reduced gradually, the point is at last reached at which the amount of vapour present completely saturates the space: any farther reduction will cause some of the vapour to condense as dew. The point of temperature at which this takes place is called the *dew-point*. It is by finding the dew-point that the determination of the hygrometric condition of the atmosphere is effected most simply and most accurately. See **HYGROMETER**.

EVE. See **ADAM**.

EVELYN, JOHN, a miscellaneous writer of the seventeenth century, born at Wotton, in Surrey, October 31, 1620; died there, February 27, 1708. After completing his course at Oxford he began to study law at the Middle Temple. In 1641 he visited Flanders, and paid visits to other parts of the Continent between 1644 and 1646, and again between 1649 and 1652. He made some efforts in favour of the royal cause in 1659, on which account he was much favoured by Charles II. after his Restoration. In 1662 he published his *Sculptura*, or the History and Art of Chalcography or Engraving on Copper, 8vo, reprinted in 1755. On the foundation of the Royal Society he was nominated one of the first fellows, and at its meetings he read a discourse on forest-trees, which formed the basis of his most celebrated publication. This was *Sylva*, or a Discourse of Forest-trees, and the Propagation of Timber in His Majesty's Dominions; to which is annexed Pomona, or an Appendix concerning Fruit-trees in relation to Cyder, &c. (1684, folio). In the reign of James II. Evelyn was one of the commissioners for executing the office of privy-seal during the absence of the Earl of Clarendon in Ireland. He continued in favour at court after the Revolution, and was made treasurer of the Greenwich Hospital. He lived for many years at Sayes Court, Deptford, and latterly succeeded to his brother's estate of Wotton, his life being that of a loyal, worthy, public-spirited country gentleman. Evelyn left a most interesting diary, picturing his life from 1641 to 1706, first published along with his correspondence in 1818 (two vols. 4to); and in 1825 his miscellaneous works were collected and published. A new edition of the Diary was issued in 1827, and republished with notes, &c., in 1858; another, with Life by H. B. Wheatley, in 1879 (four vols.). The miscellaneous works include historical and political tracts, essays on economic subjects, gardening, architecture, &c.

EVERDINGEN, the name of a celebrated Dutch family of painters. Of these **CÆSAR VAN EVERDINGEN** was distinguished as a portrait and historical painter and architect. He was born at Alkmaar 1606; died, 1679. His younger brother, **ALDERT VAN EVERDINGEN**, was a celebrated landscape-painter, born at Alkmaar 1621; died, 1675. His sea pieces, in which he represents the disturbed elements with great truth to nature, are particularly celebrated. In forest scenes too he was a master. He is known also as an able engraver by his plates to Renard the Fox.

EVERETT, ALEXANDER HILL, an American diplomatist, born at Boston, March 19, 1792; died at Canton, May 29, 1847. While studying jurisprudence under John Quincy Adams, he published his first essay, in a review called the Monthly Anthology. In 1809 he accompanied Adams to St. Petersburg, where the latter had been appointed American minister plenipotentiary, and in 1812 returned to America by way of England. On his return he followed for a time the legal profession, but three years after he was again in Europe as secretary of legation at the Hague. This post he exchanged for that of *chargé d'affaires* in 1818, and he remained at the Hague in the latter capacity till 1824. The year following he was sent to Spain, and in 1829 returned to America, where he was elected to the senate of Massachusetts in 1830. In 1840 he was charged with a secret mission to Cuba, and in 1846 was sent to China, where he died. He is the author, among other works, of Europe, or a General Survey of the present Situation of the Principal Powers (Boston, 1822); America, or a General Survey of the Political Situation of the several Powers of the Western Continent (Phila. 1827); New Ideas on Population (Lond. 1828).

EVERETT, EDWARD, an American statesman and author, brother of the preceding, born at Dorchester, Massachusetts, April 11, 1794; died at Boston, U.S., January 15, 1865. He was educated for the church, but in 1814 was appointed to the chair of Greek Literature at Harvard College. To qualify himself fully for the duties of this position he came to Europe, and spent two years at the University of Göttingen. In 1818 he came to England, where he enjoyed the intimacy of Sir Walter Scott, Sir James Mackintosh, Lord Romilly, Jeffrey, and a number of other distinguished men. He returned to America in 1819, and entered on the duties of his chair. He also became the editor of the North American Review, which he continued to edit till 1824. In this year he delivered the first of a long series of eloquent addresses and speeches, which placed him in the first rank of American orators, and was elected a member of Congress. In the autumn of 1834 he was elected governor of Massachusetts, an honour which was accorded to him on two subsequent occasions. In 1840 he was nominated minister plenipotentiary in England. In 1845 he became president of Harvard College. In 1852 he was appointed Secretary of State by President Fillmore, and in the following year, after his retirement from the cabinet, was elected to the Congress as senator for Massachusetts; but a year after he was obliged to give in his resignation owing to ill health, and he then retired into private life. A collection of his orations and speeches from 1825-58 has appeared in three vols. (1836-50-58). He is also the author of A Defence of Christianity, which appeared in 1814.

EVERGREENS, plants that retain their leaves in full verdure throughout the winter till the ensuing spring, when they ultimately fall. It was at one time a common error to suppose that evergreens never part with their leaves. This error was countenanced by the Greek mythology, for Theophrastus relates that it was reported that in the neighbourhood of Gortynia, in Crete, a plane-tree grew which never shed its leaves, being the tree under the shade of which Zeus is said to have had his interview with Europa. But Theophrastus was himself acquainted with the fall of the leaves of the evergreens. The cause of the belief that their leaves never fall is that they do not fall until the young leaves have begun to appear, so that trees of this sort are never wholly without leaves. In warm climates many plants retain their leaves for several years, but no such plants are to be found native to temperate and polar climates. Among the best-known evergreens are most of the trees belonging to the order of the Coniferae, the holly and ivy, box, privet, rhododendron, myrtle, &c.

EVERLASTING FLOWERS, a name applied to certain plants belonging to the natural order Compositae, from the fact that when dried they suffer little change in their appearance. By the French they are called *immortelles*, and this name has been introduced into our own language as applied to wreaths made of such flowers to be placed beside recent graves as emblems of immortality. The plants to which this name is peculiarly applied belong to the genus *Helichrysum*, and are natives of Cape Colony and Australia; but it is also given to members of allied genera, such as *Antennaria*, *Gnaphalium*, *Aphellexis*, *Phacocoma*, &c. The native women of Australia are fond of decorating their hair with the flowers of *Helichrysum elatum* and *Helichrysum bracteatum*.

EVESHAM, a borough and market town in England, county and 15 miles S.W. of Worcester, beautifully situated in the vale of the same name, on an

scollivity above the Avon, here crossed by a bridge of eight arches. It is an ancient place, and was the scene of a battle fought in 1265, which replaced Henry III. on the throne. It had a celebrated abbey, of which a fine tower and some other structures still remain. A parl. borough till 1885, it now gives name to a parl. division. Market-gardening is the chief industry. Pop. (1901), 7101.

EVIDENCE, in its most general sense, means the facts or arguments which establish, or have a tendency to establish, any conclusions. It may be divided into three sorts, mathematical, moral, and legal. The first is employed in the demonstrations which belong to pure mathematics; the second is employed in the general affairs of life, and in those reasonings which are applied to convince the understanding, in cases not admitting of strict demonstration; the third is that which is employed in judicial tribunals for the purpose of deciding upon the rights and wrongs of litigant parties, and is that of which we shall treat here.

According to the English system of jurisprudence in common law trials, it is the province of a jury to decide all matters of fact. The verdict of the jury is, however, to be given, and the trial is to be held in the presence of a judge or judges, who preside at the trial, and are bound to decide matters of law arising in the course of the trial. Whenever, therefore, a question arises, whether any thing offered as proof at such trial is or is not proper to go before the jury as evidence, that question is to be decided by the court, and, unless permitted by the court, it can never legally come to the consideration of the jury. Hence, whatever is so permitted to be brought before the jury for the purpose of enabling them to decide any matter of fact in dispute between the parties, is, in a legal sense, *evidence*, and is so called, in contradistinction to mere argument and comment. This gives rise to a very important distinction at the common law, as to the *competency* and the *credibility* of evidence. It is *competent*, when, by the principles of law, it is admissible to establish any fact, or has any tendency to prove it. It is *credible*, when, being introduced, it affords satisfactory proof of the fact. It follows, therefore, that evidence may be *competent* to be produced before a jury, when it may, nevertheless, not amount to *credible* proof, so as to satisfy the minds of the jury; and, on the other hand, it may be such as, if before them, would satisfy their minds of the truth of the fact, but yet, by the rules of law, it is not admissible. Whether there is *any evidence* of a fact is a question for the court; whether it is *sufficient* is a question for the jury, when the cause is tried by a jury.

Evidence is, in its nature, divisible into two sorts:—first, that which is *direct* and *positive* proof of any fact; and, secondly, that which is *presumptive* and *circumstantial*. It is again divisible, in respect to the mode or instruments of proof, into two sorts:—first, *written* evidence; and, secondly, *unwritten* or *oral* evidence. We are accustomed to consider that as *direct* and *positive* evidence, which is proved by some writing containing a positive statement of the facts, and binding the party whom it affects; or that which is proved by some witness, who has, and avers himself to have, positive knowledge thereof, by means of his senses. Whenever the fact is not so directly and positively established, but is deduced from other facts in evidence, it is *presumptive* and *circumstantial* only. Perhaps, in a strictly philosophical sense, much of the evidence usually denominated *positive* is but *presumptive*; for there is an admixture in it of some circumstances of presumption, though the presumption may usually be deemed irresistible proof. For instance, a promissory note is offered in evidence as

signed by the defendant; a witness, who attested it, swears to the execution and signature of the defendant. This is usually deemed positive proof; and yet it will be at once perceived that it rests on the *credibility* of the witness, and the *presumption* that he has sworn what is true, which is a fact that in its nature is not capable of absolute proof. But, however this may be, in a practical sense the distinction above stated is sufficiently intelligible and well-settled for all the purposes of human life.

I. As to *presumptive evidence*. It must be obvious that in a very great proportion of the questions of fact arising in the litigations before judicial tribunals, the proofs must be of a merely presumptive nature. The want of written proofs; the death, or defect of memory, or treachery of witnesses; the temptations to suppress evidence; the very nature of the transaction itself, founded in fraud, or in secret contrivances, or in personal confidence; all these, and many other considerations, require us to recur perpetually to presumptive evidence. And especially is this true in respect to public crimes; for these are rarely committed under such circumstances as lead to positive, unequivocal evidence of them. All presumptions are necessarily founded upon the connection which human experience demonstrates usually to exist between a certain fact or circumstance, and other facts and circumstances. When the one occurs the others are presumed to accompany them. Some presumptions of this nature are so strong and irresistible that the law adopts them as *presumptions juris et de jure*. Others, again, are left to be judged of according to the weight which the court and jury may think them entitled to, taken in connection with all the other circumstances of the particular case. There are other presumptions, or rather circumstances of presumption, which are so uncertain and unsatisfactory in their own nature that the law rejects them as unworthy of any credit, and too unsafe to found any judgment upon. Thus it is a general rule that hearsay or mere report and reputation of a fact is not evidence, for this amounts to no more than the mere declarations of third persons, not under oath, and of facts of which they may have no certain knowledge. Our law generally requires that every fact to be substantiated against a person should be proved by the testimony of a witness (when it is to be proved orally) who is sworn to speak the truth; or, if it is dependent upon written evidence, it must be proved by evidence that is sanctioned by him, or by which he ought to be bound, as importing truth. There are, however, some exceptions to this rule. Whenever the hearsay or declaration accompanies a fact, or, as it is often expressed, is a part of the *res gestæ*, it may be evidence. The admission of hearsay, too, is limited in extent, even in these classes of cases. It is admitted only to prove public or general rights, and matters of general reputation. But it is said to be inadmissible to prove mere private rights or particular facts; as, for instance, upon a question of boundary, that a post was put down in a particular spot; or in a case of birth, that the birth was in a particular place; or that a party has a private right of way. Presumptions, favourable or unfavourable, often arise from the conduct, or motives, or want of motives, or character, or habits of a party, and may justly influence the decision of a case. But it would lead us too far to enter upon a full illustration of these remarks. On the subject of presumptions the common law has laid down many rules, which, however, in the compass of this article, it is impossible to enumerate.

II. As to *oral* or *unwritten evidence*. Having considered the nature and operation of presumptive evidence, we may now pass to a consideration of some

of the rules of evidence as to witnesses—when they are and when they are not competent to give testimony. In general, it may be said that all persons not under any known disability are competent witnesses. The principal ground of incompetency now existing in the common law of England is want of reason or understanding. Persons insane, lunatics, and idiots are incompetent to be witnesses. But lunatics and persons temporarily insane are, in their lucid intervals or returns of reason, restored to their competency. A person deaf and dumb, if he has sufficient understanding, and can by signs make known his thoughts through an interpreter, or otherwise, is competent. But a person deaf, dumb, and blind would be deemed incompetent. Children are admissible as witnesses as soon as they have a competent share of understanding, and know and feel the nature of an oath, and of the obligation to speak the truth. There can, therefore, scarcely be assigned any precise age for the admission of them as witnesses. And the like circumstances would govern the case of persons whose memory and understanding are greatly impaired by age. Another ground of incompetency used to be the want of religious belief. It was held that there was no certain sanction or obligatory force upon the conscience of a man unless he believed that his telling or not telling the truth would make him accountable to a Supreme Being for his conduct; and that, if he told a falsehood, the Supreme Being would punish him accordingly. The law, therefore, required that a person, to be a witness, should believe in the existence of a Supreme God, to whom he was accountable for his actions. The rule was usually laid down in the books with this addition—that he should also believe in a future state of rewards and punishments. And it was accordingly held by some judges that if he did not believe in a state of punishment, but only of reward, in a future world, he was not a competent witness, although he might believe in punishment in the present world for all crimes by the order of Providence. But this doctrine was doubted and denied by other judges, who held that if a witness believed in a God, and that he would punish him in this world if he swore falsely, he was admissible, notwithstanding he might not believe in a future state. It was formerly also a rule that infidels, or disbelievers in Christianity, such as Jews, Mohammedans, and the various kinds of heathen, were not competent witnesses. But affirmations may now be made by those holding no religious belief at all, or by those objecting to oaths from religious scruples, in terms of the Evidence Amendment Act, 1869, and more particularly by the Oaths Act of 1888. A false affirmation renders a person liable to punishment for perjury equally with a false oath. Infamy of character (infamy attaching to a person from having been convicted of a crime deemed by the law infamous), and the fact of a person's being legally interested in a case, were formerly also held as grounds of incompetency in a witness. But the principle of absolutely excluding evidence in the cases above mentioned has been abandoned, and the objection is now admissible only as affecting the *credibility*, and not the *competency* of a witness. The regulating statutes are 6 and 7 Vict. cap. lxxxv., and 14 and 15 Vict. cap. xlix. The former declares that no person offered as a witness shall hereafter be excluded by reason of incapacity from crime or interest from giving evidence on any issue or inquiry, civil or criminal; and the latter declares that even the parties to a cause shall be both competent and compellable to give evidence on behalf of either or any of the parties, except where the question tends to criminate the person examined, &c. Except

when the one is accused of injuring the other, husband and wife are not generally competent to give evidence for or against each other in criminal cases. Latterly, however, the exceptions to this general rule have increased in number, and include cases under the Criminal Law Amendment Act (1885), certain prosecutions under the Licensing Acts, &c. By an act passed in 1898, accused persons were enabled to give evidence on their own behalf. Witnesses, having first taken the oath or affirmation, are usually examined in open court by the party on whose behalf they are brought forward. They are then cross-examined by the opposite side, after which they may be again examined by their own side. Leading questions, that is, such as point to a particular answer desired, are not allowed to be put except in cross-examination. No witness is called upon to give an answer that may subject him to a criminal prosecution.

In respect to oral or unwritten evidence, there are some other rules which it may not be without use to state. And, 1, as to *admissions*. These, when made by the party himself, or by his agent in the particular transaction, are evidence against him, though not for him. If there are several persons having a joint interest, an admission of one of them in respect to the joint interest is evidence against all. So an admission of one partner, as to partnership transactions, is evidence against all the partners. But in cases of crimes and torts, the rule is more limited. There the admission of one defendant does not affect the others, unless it be a part of the *res geste*; or there be proof of a common conspiracy or design, and the declarations of the party respect that design, and are a part of it, or are made in the course of executing it. But the admissions or declarations of an agent are not evidence against the principal, unless they are made in a case within the scope of his employment, or are a part of the *res geste*. His admissions at another time, or in another employment, are not so. What he states while he is doing an act, as agent, is evidence; what he states historically afterwards, as to the acts and proceedings under his agency, is not, because better proof may be obtained, for he may be called to appear personally as a witness. There is a distinction in respect to the effect of admissions. In some cases they are conclusive, in some not. They are often conclusive when the party has thereby induced another to act, or give credit. In many other cases they may be contradicted, where they do not operate as a fraud on other persons.—2. Secondly, in respect to *confessions*. The common law seems to have taken a distinction as to the effect of confessions in civil cases and in criminal cases. Generally speaking, they are evidence in civil cases as admissions. In criminal cases, a free, voluntary confession by a party of his guilt is also evidence, and is sufficient, *per se*, to found a conviction; but where a confession has been obtained by duress, or threats, or by a promise of pardon by an agent of the government or the prosecutor, and the promise is not complied with, the confession cannot be given in evidence.—3. Thirdly, as to the number of witnesses. Generally speaking, by the common law, the testimony of a single witness, if believed, is sufficient to establish any fact. There are, however, certain exceptions: First. On an indictment for perjury the evidence of one witness is not sufficient to convict, for that would be only oath against oath. There must be either two witnesses, or strong independent evidence by circumstances to corroborate the testimony of one. Secondly. In cases of treason, by statute in England, there must be two witnesses to the same overt act of treason, or one witness to one, and another witness to another overt act of the same treason. Any confession would be sufficient, even

when made out of court, if proved by witnesses. But in regard to collateral facts a single witness is sufficient, even in cases of treason.

III. In respect to *written evidence*. This is divisible into various sorts:—1. Statutes or acts of the legislature. 2. Judgments. Those of the superior courts of law are matters of record, and are conclusive. Generally speaking, verdicts and judgments are evidence in cases between the parties to the suit and privies; but they are not evidence in cases between strangers. There are some exceptions to the general rule. *a.* The judgment in a suit between strangers is sometimes admissible, as the record of a judgment against a principal, who has been convicted of a felony, may be given in evidence against an accessory. *b.* Judgments of courts of a peculiar and exclusive jurisdiction are sometimes conclusive upon all persons. Thus judgments *in rem*, in cases of seizures by the exchequer and other courts having exclusive jurisdiction, are conclusive. So sentences of ecclesiastical courts in cases of which they have exclusive jurisdiction. *c.* Judgments in cases of *general rights*, as of a right of common, a public right of way, a custom, a pedigree, &c., are admissible as evidence of such right, custom, &c., in suit between third persons. 3. There are other judicial proceedings which are not strictly matters of record, as decrees in chancery and judgments in inferior courts, to which, however, the same general principles apply, as matters of evidence, as to judgments of record. 4. Depositions also, awards and examinations by magistrates, are often evidence in cases between the same parties. There are also cases in which public writings, not judicial, such as journals of Parliament, public gazettes, rate or tax books, ships' registers, rolls of manor courts, corporation books, and books of public entries, &c. &c., are evidence. But to go at large into the distinctions applicable to them would occupy too much space.

IV In respect to *private writings* the rules applied to oral testimony are generally applicable here. Such writings are evidence between parties and privies, but not between strangers, except under the limitations already stated. There are some few cases in which the written statements of the party himself may be given in evidence in his own favour, such as, for instance, his account-books, to verify charges made by him in respect to debts and charges, which are properly matters of account, such as debits and charges for goods sold, for labour and services, and for materials furnished. But the most common question that arises in respect to written instruments relates to the mode of proving them to be genuine, or what they purport to be. When the original instrument is produced, if it is objected to, and there is a witness who subscribed it, he must be called to prove the due execution of it by the party whom it purports to bind. If the witness be dead, or out of the country, the handwriting of the witness must be proved by some person acquainted with it, and then it will be presumed that the witness saw the due execution of it; and it is evidence without further proof. If there is no witness who subscribed it the handwriting of the party who executed it may be proved by some person who is acquainted with it. But it is not sufficient to prove it by comparison of the handwriting with the known handwriting of the party, though such evidence may be admitted in some cases as corroborative evidence. And it has been held that in case of deeds even the *admission* of the party that it is his deed, or that he executed it, is not, at least where there is a subscribing witness, proof of the due execution of it. If the instrument is lost, upon proof of the loss (and the party to whom it belongs may be sworn to prove the loss) the con-

tents of it may be established by a copy or other proper proof. After an instrument has been executed thirty years, and any possession has followed, or right been exercised in conformity to it, it is admissible without any proof by witnesses. In respect to *written evidence* a question often occurs how far parole (oral) evidence is admissible to control or affect it. There are two sorts of ambiguities affecting written instruments. One is called *latent ambiguity*, and the other *patent ambiguity*. The latter is such as appears upon the face of the instrument itself, from the doubtful nature of the terms used. The former is where the terms of the instrument are of themselves certain and free from doubt; but the ambiguity arises from some extrinsic matter or fact, collateral to the instrument. As, for instance, if A grant his manor in B to C, and he has two manors in B, the whole difficulty arises, not from the instrument itself, but from the extrinsic fact that he has two manors, for if he had but one that would surely pass. If A devise an estate to his nephew B, and he has no such nephew, but he has a nephew C, there is the same latent ambiguity. In each of these cases, and indeed in all cases of *latent ambiguity*, parole evidence is admissible to show what or who was intended, for as the difficulty arises from parole evidence, that may also be resorted to in order to remove it. But in cases of *patent ambiguity* it is otherwise. Parole evidence cannot be admitted to supply a meaning which the words do not of themselves import, or to give certainty where the words are uncertain. Indeed the general rule in our law is that no parole evidence is admissible to vary, explain, or control written instruments, to add new terms to them, or to limit or restrain the import of the words used in them. The exceptions to this rule are too minute to be here specified.

We will close this outline of some of the leading principles of our law on this subject with an enumeration of a few rules, which did not properly fall under any former head. 1. As to the question on whom the burden of proof (*onus probandi*) lies. Generally it rests on the party who alleges the affirmative of any proposition, to establish it by suitable proof. But sometimes even he who alleges a negative must prove it; as in all cases where the party sets up a criminal neglect or omission, he must establish such neglect or omission by suitable proof; and it is not the duty of the party charged to establish his innocence, for the law will presume it in his favour until there is some proof to the contrary. 2. The best evidence that the nature of the case admits is to be produced. The meaning of this rule is not that, in all cases, the highest possible evidence is to be adduced; but such evidence as presupposes that no better is behind, and in the power of the party. The evidence, for instance, of a written contract is the original instrument; and therefore a copy is not generally admissible. But if the original is proved to be lost, then a copy is evidence; for that is the next best proof. In such case the copy must be proved to be such. Again, oral evidence will not be admitted if there is a copy in existence; but if there is no copy, then it is admissible. But where the best evidence is given, it is not necessary to fortify it by producing all that exists of the same kind. As, if there be two witnesses to a deed, it is sufficient to prove it by one. There are certain exceptions to this rule, founded on public considerations; as, for instance, the original of a public record need not be produced; but a copy is sufficient; for the public records ought, for general convenience and preservation, to remain always in one place. 3. Generally facts only are evidence, and not the mere opinions of witnesses. But there are certain exceptions; as, in questions of science or trade, persons of skill may be asked their

opinions. Thus, a surgeon may be asked if a particular wound or injury would, in his opinion, produce death; and a shipwright his opinion as to the seaworthiness of a ship. 4. The substance only of any particular point or issue of fact need be proved. This gives rise to a great variety of questions as to the materiality or immateriality of particular circumstances, included in the point at issue. 5. There are certain things which courts and judges will judicially accept without any proof; as all public and general laws, all general customs of the realm, the commencement and prorogation of the sessions of the legislature, the ordinary computation of time by the calendar, public holidays and festivals, and so on. But of local customs and usages, of foreign laws, of peculiar tenures, &c., judges and courts will not take notice. See also CONFIDENTIAL COMMUNICATION, DYING DECLARATION, ESTOPPEL.

EVIL, ORIGIN OF, the subject of an appalling quantity of barren speculation. A common answer to the question of the origin of sin or moral evil would be that it came into the world through the Fall; but this, of course, is no real answer, as we still have to learn the origin of the devil and of the evil that is in him. Perhaps the oldest theory upon this subject is that of the religion of Zoroaster, according to which there were two original principles, one good (Ormuzd) and the other evil (Ahriman). This is the doctrine that passed over into Manichæism, being adopted by Manes, who attempted to ingraft it on the doctrines of Christianity. Akin to the doctrine of Manichæism is that of the Gnostics, who taught that there was an original formless substance, to which they did not attribute a personal existence, but which they represented as being in its own nature evil, and as always resisting the divine Creator. In contradistinction to these dualistic theories with reference to the origin of evil stand the monistic theories, such as that of Plato. Plato held that the good was the essence of all things, and that the evil and imperfect contained in them had no real separate existence. The theory enunciated by Leibnitz in his Theodicee resembles that of Plato. In that work he assigns to the evil existing in the world created by God, which he holds to be the best of all possible worlds, a merely relative existence; all that we call evil is, he holds, only evil to us because we do not see it in relation to the rest of the universe, for in relation to the universe it is not evil but good, and accordingly cannot be evil in its own nature. The Pantheism of Spinoza agrees with the last-mentioned theories in denying the real existence of evil. Another view on the subject is that which traces evil to the natural imperfection of all created being, holding that it is an inseparable attribute of everything but the Uncreate. 'Imperfection is inseparable from created substance, and imperfection is evil in varying degree.' 'Evil is our allotted element of trial; it is as the fire that purges out the dross, where it is endured in a fitting spirit; and is always the standing proof that man's will is free' (J. H. Blunt).

EVIL EYE, a power which, according to an old and wide-spread superstition, resides in some people, of doing injury to others by a mere look, or a look accompanied by certain words or charms. The ancient Greeks and Romans believed in the existence of this evil influence, the former giving to it the name of *baskania*, the latter that of *fascinum* (whence our *fascinate*, *fascination*). Children and cattle in particular were supposed to be liable to the injurious effects of the evil eye, and amulets or charms were worn for the purpose of warding it off. To spit three times on one's own dress was also believed by the ancients to be a protective against the evil eye. Witches were always supposed to be capable of ex-

ercising the influence of the evil eye; but even good people may be possessed of the malign gift, and may exercise it, unknown to themselves and against their own desire. In Italy, where the superstition is very deeply rooted among the people, Pope Pius IX. was believed to be possessed of this fatal power. To the Italians the evil eye is known as the *jettatura*, the possessor of it being a *jettatore*. Amulets are very commonly worn as a protection. This superstition is still prevalent among the more ignorant classes in Sicily, Russia, Andalusia, Greece, Turkey, Egypt, the Highlands of Scotland, and many other places, and various means are still resorted to, as they were by the ancients, to ward off the baneful influences. Jewellers of Seville sell small pieces of stag's-horn set in silver, which are hung round the necks of children to protect the wearer.

EVOLUTION. In the natural sciences the term evolution is used to denote the process by which an established state of affairs, or system of things, or degree of organization, after persisting for a time, gives rise to another. Thus, we speak of the evolution of the solar system, the evolution of continents, the evolution of plants, the evolution of animals, the evolution of man, the evolution of the brain, and so on endlessly. Evolution expresses the same idea as the term development, but it is convenient in biology to restrict the latter to the growth of the individual (ontogeny), and to keep the former for the growth or history of the race (phylogeny). The fundamental idea of evolution is the essentially simple one, that 'the present is the child of the past and the parent of the future'; or, from another point of view, that 'there is nothing in the end which was not also in the beginning'. More concretely, when we say that the living creatures which we see around us have been evolved, we mean that they are the descendants of ancestral forms on the whole simpler, and that these ancestors were descended from still simpler forms, and so on backwards—until the scientific imagination loses itself in the mist of life's beginnings. The process of change has been on the whole, as the rock-records plainly show, towards increased complexity of structure (differentiation) and towards increased unification and harmonious control of life (integration); but there are many cases of degeneration, both among plants and among animals, where the usual direction of evolution has been in a sense reversed, and where degenerate forms, having become adapted to parasitic or sedentary or easy-going conditions, are in many respects simpler than their ancestors. In its higher reaches, especially in mankind, evolution has been in great part a progress in *psychical integration*; but the general idea is the same whether we are dealing with the increasing complication of skeletal architecture in sponges or with the increasing complication of cerebral convolutions in mammals.

Historical.—The evolution-idea seems to have been recognized first in relation to human history; thence it was projected upon inanimate and animate nature. One form of institution grows out of another, one race out of another, one language out of another; thus the question naturally arose whether the same may not be true of the order of nature as a whole. Laplace applied the idea in astronomy, and in his famous nebular hypothesis sought to show how the solar system may have been evolved from a simpler antecedent state of affairs. Similarly, Lyell was the most prominent among those who showed that in regard to the configuration of the earth the evolution-formula is vividly descriptive. From inanimate nature and human affairs the fertile idea spread like a leaven to the study of fauna and flora

and man himself. What Lucretius and much earlier thinkers had dreamt of, what Leibnitz and Schelling and Kant and other philosophers with strong interests in the outer world had sketched in general terms, what Buffon, Erasmus Darwin, Lamarck, Treviranus, Etienne Geoffroy St. Hilaire, Goethe, and others had ventured to promulgate, became through the work of Charles Darwin, Alfred Russel Wallace, Herbert Spencer, and Ernst Haeckel current intellectual coin—the theory of descent. From biology the idea spread to psychology, and the origins of instinctive, intelligent, and rational activities were sought after; finally the idea came home again to its original starting-point, as a formula applicable to human history. Already the idea is fast becoming organic in our way of thinking about the origin of all present appearances—whatever be their nature—as a thought-economizing formula applicable to all orders of facts.

Analogy of Evolution and Development.—Applied to plants and animals, the suggestion involved in the evolution-idea is that the presently existing forms are the descendants of relatively simpler ancestors, that they represent, as it were, the tips of many branches which gradually run together as we trace them backwards or downwards, until they finally unite in a common base—the original forms of life of which nothing is directly known. Moreover, it is implied that the evolution of a race, say of horses or of roses, has been a continuous natural process of slow transformation, just as the individual development of horse or rose-bush is demonstrably a continuous natural process of slow transformation from the apparently simple to the obviously complex. We know as yet but little in regard to the actual factors at work in the marvellous process by which a plant or an animal develops in a few days or weeks or months out of an apparently simple fertilized egg-cell; similarly, we know as yet but little in regard to the actual factors which were at work in the marvellous process by which a race of plants or animals, or a particular type, is supposed to have evolved through unthinkable long ages from its apparently simpler presumed ancestors. In neither case has biology advanced far in its analysis of the factors, yet in both cases the majority of biologists would unhesitatingly accept the fact—that a bird grows from an egg by a process of natural development, and that the race of birds has arisen from a reptilian ancestry by a process of natural evolution. But while the development of the bird may be seen taking place, the evolution of the race of birds is hidden in the past; so that we naturally ask for the evidence which has led naturalists to the confident acceptance of the evolution-doctrine.

Evidences of Evolution.—The evolution-idea has been accepted by naturalists partly because it has proved illuminative in regard to other orders of facts, partly because it has been so useful in promoting and giving point to research, and partly because of certain so-called 'evidences', which, though not demonstrative, have nevertheless a cumulative value in establishing a presumption in favour of the interpretation suggested. For it must be clearly recognized that the doctrine of organic evolution does not stand on a secure inductive basis, like for instance the doctrine of the conservation of energy or the theory of gravitation. We are aware of no facts which are contradictory to it, the constant accumulation of new facts brings none to light which it does not fit, but it is a logical error to speak of the doctrine as demonstrated. There is even a slight confusion of thought in speaking of the 'evidences of evolution', since all the known

facts of life may be construed as part of the evidence. But as there are certain kinds of facts which suggest the evolution-idea more forcibly than do others, the nature of these may be indicated.

(a) It is well known that even within the short period covered by careful observation, the forms of life do not remain constant in their characters. Even among forms that are so essentially like one another that they are called by one name—the name of their species—changes are continually occurring. Some of these changes seem to be definitely related to use or disuse or to some alteration in the external conditions (or environment), and we call these modifications or acquired characters. It is very doubtful whether these are transmissible. But there are other changes which begin to appear before or at birth, and cannot be referred directly to changes in function or environment, but seem plausibly due to changes in the germinal material or hereditary substance before or during or after fertilization, and we call these germinal or congenital variations. There is no doubt that these are in varying degrees transmissible, though they may not always be transmitted. By selecting the possessors of suitable variations and causing them to interbreed, cultivators of plants and breeders of animals have in a short time reared many distinct races, as is well known in the case of cabbages and chrysanthemums, pigeons and rabbits, horses and dogs. If man by slight interference can secure these results in a very short time, the inference is suggested that in the enormous time during which living creatures have existed upon the earth, proportionately great changes may have been wrought out.

(b) The immense array of plants and animals—living and extinct—that we know can be classified in orderly series. We see various types of organic architecture, bound together by structural affinities, grading into one another, rising one above the other in more and more elaborate complexity and gradually increasing integration. They can be arranged in a scheme of classification, which, though still very imperfect, may be expressed in the form of a genealogical tree. The suggestion is, that the affinities and gradations, on which the classification is based, have a historical meaning, that they express blood-relationships, that they point to a descent from common ancestors. Moreover, in a large number of cases the boundaries between what are called distinct species are seen on closer examination to be much less definite and discontinuous than they at first sight appear to be. Species is linked to species by intermediate varieties; genus is linked to genus, and family to family; nor are there wanting synthetic types or 'missing links' which help us in imagination to bridge the gulf between distinct types, e.g. *Peripatus* between Annelid worms and Insects, or *Balanoglossus* between some 'worm'-like stock and Vertebrates. Remarkable also is the manner in which, in distinct groups, the same organic material is turned and twisted to diverse results; how, for instance, essentially the same structure of muscle and bone, nerve and blood-vessels, is used in Vertebrate animals to form the frog's anterior limb, the bird's wing, the horse's fore-leg, the whale's flipper, the man's arm, and so on. These homologies or essential similarities in structure and development seem to be most readily interpreted as expressions of a natural descent from common ancestors. Another notable fact is the frequent occurrence of vestigial structures, such as the rudimentary hind limbs of whales, the rudimentary two sets of teeth in the whale-bone whales, the visceral clefts in reptiles, birds, and mammals, which are certainly homologous

with gill-clefts though all possibility of branchial respiration has disappeared. They are only of indirect use, and yet they persist, like, as Darwin said, the unsounded letters in certain words—practically of no direct use—yet giving (here the interpretation comes in) a hint as to the ancestry of the forms which possess them. They are relics of the past, and man himself in this regard carries about with him in his body a museum of antiquities.

(c) Alike in the history of a race as revealed in the geological record, and in the development of the individual organism, which is the problem of embryology, we find numerous facts which suggest, though they do not demonstrate, that the evolution-conception is an adequate modal interpretation of the world of life. Thus we have the broad fact that in the history of the earth, fishes preceded amphibians, amphibians preceded reptiles, reptiles preceded birds; and many other illustrations show that lower races appeared on the scene before higher ones. It is also possible to work out what are called 'palaeontological series', in which there is a structural progress in certain stocks, families, or genera, as we pass from later to more recent formations; for example, the series of horse-like mammals, of crocodilian reptiles, of nautiloid cephalopods, of ammonites, and so on through a long list. And again, the rock-record discloses extinct types which bridge some of the structural gaps between the living races; thus, *Archaeopteryx*, the oldest known bird, helps to link the modern birds to their presumed reptilian ancestry, and the extinct Eurypterids lessen the apparent gap which separates the King-crab (*Limulus*) from other jointed-footed or Arthropod animals. Not less suggestive is the study of individual development, showing a strikingly gradual progress from the apparently simple to the obviously complex, and an undeniable parallelism between stages in individual growth and grades of organization expressed in the adults of lower forms. It is more rhetorical than scientific to say that an animal in its individual development 'climbs up its own genealogical tree', especially since the construction of that hypothetical genealogical tree depends partly on the data furnished by the study of development; but even a brief study of the fortunately preserved stages in the individual growth of fossil Cephalopods, or of the familiar circuitous life-history of the common frog, shows a parallelism between individual development and racial history which is strongly suggestive of the evolution-idea. At the same time, it must be re-emphasized that conviction as to the value of the evolution-theory is to be attained, not by a laborious induction, but by its practical justification of itself as a working formula in the study of all orders of facts.

Factors in Organic Evolution.—By the cumulative force of the presumptive evidence we may become convinced that the race of birds evolved from a more ancient reptilian stock, and that the thousands of different kinds of living forms have evolved from a few primitive types, of which we get some hint in *Archaeopteryx*, the oldest of the extinct birds. It is quite another matter, however, to profess to understand the precise steps and factors in the process by which 'the slow, cold-blooded, scaly beast ever became transformed into the quick, hot-blooded, feathered bird, the joy of creation'. The only possible method is to discover the factors which are at present at work in nature, to combine these in a consistent theory, and to test this by applying it to the concrete facts. As it is quite likely that we have not as yet detected all the factors at present operative in producing organic change, and still

more likely that we have not succeeded in rightly estimating the relative value of these factors, no completeness can be claimed for the theory of organic evolution in any of its forms. It is also evident that the process of verification which must succeed the process of interpretation will necessarily demand prolonged observation and experiment. The logical possibilities, deduced from a study of particular cases, must be shown to be real possibilities for each particular case. Already, however, considerable progress has been made in this respect, and a more stable evolution theory is being gradually evolved.

Originative Factors.—When we compare children with parents, brother with brother, neighbour with neighbour, native with foreigner, but always keeping within the limits of what is called a species, such as the domestic sparrow (*Passer domesticus*), or the edible snail (*Helix pomatia*), or the buttercup (*Ranunculus Ficaria*), we find that the individuals are not by any means always alike in all their characters. We can measure many of the observed differences, and make curves expressing the results. There is no fact more certain than that changes in the structure of plants and animals do occur from generation to generation, and it is in such changes that we must find the raw material of evolution. When the observed differences are studied more carefully, it becomes apparent that a number of them may be directly connected with changes or differences in the surrounding influences or environment, or with changes in the activity or functions of the organism. It is characteristic of these changes that they do not appear until some particular change or difference in the environment or function occurs, and that they are usually exhibited in some measure by all the members of the species who may be subjected to the given environment, or who may exhibit the given change of function. In other words, they can be induced experimentally. It is convenient, as we have already noted, to call these changes 'modifications', but they are often referred to under the title 'acquired characters'. A 'modification' is a change in bodily structure which transcends the limits of organic elasticity, which has, that is to say, some persistence, which may, moreover, be correlated with definite changes in environment or in function. To take simple examples: the sunburning of the skin in a tropical country; the changes in a plant's leaves and flowers when it is transplanted to a quite different habitat; the alterations of even skeletal structure which follow a peculiar occupation or function, like shoemaking; the change of colour in a canary's plumage after a special diet; the dwarfing of water-snails which are reared in confined space where they have insufficient exercise, &c.; the changes in a brine-shrimp's tail induced by altering the salinity of the water, these are all 'modifications'—bodily changes which have some measure of persistence. Such 'modifications' are often of considerable value to the individuals who acquire them, as may be illustrated by unusual hardening of the skin on positions, like the sole of the foot, which are subjected to unusual influences of pressure, &c., in people who go barefoot. Many naturalists regard these bodily modifications as forming part of the raw material of evolution; but this cannot be the case unless the modifications are as such in some degree transmissible to the offspring, and this has not as yet been proved experimentally. Unless the bodily modifications have a specific and representative effect upon the germ-cells, such that these, when they develop into offspring, will reproduce the modification in some measure, then these modifications, however important in the individual life, are not of direct importance in the racial evolution. It is much too soon to venture on any dogmatic

statement on the subject, but as yet no secure evidence of the transmission of acquired characters has been furnished.

Now, when we consider the sum of observed differences, and the sum of what may be proved to be, or may be plausibly regarded as 'modifications', we find that the latter do not nearly equal the former. It is necessary, therefore, to seek for some other source of the observed differences, and it is customary to call the residual differences (which remain after subtracting the modifications from the observed differences) by the technical name of 'variations', the term being often qualified by such adjectives as 'spontaneous', 'congenital', 'constitutional', 'germinal'—all of which refer to the fact that we cannot relate them to differences or changes in environment or in function. These 'variations' may appear very early, even before birth; they are exhibited unequally by the members of the species; they are certainly transmissible, though not always transmitted; they are such as may be fairly regarded as forming the raw materials of possible evolution. As to their causes, it is almost premature to speak, but there are several obvious possibilities, none of which is without some basis of fact. Thus (a) the variations may be due to the readjustment brought about in the mingling of hereditary qualities which occurs in the fertilization of the egg-cell by the spermatozoon; or (b) they may be due to the influences on the complex germinal material exerted by the variable nutritive conditions within the body, or by the variable environment external to the body. There is no doubt that many diseased conditions have their beginning in a more or less mysterious germinal source; they cannot be ascribed to the direct action of environment or of function upon the body; they are congenital, constitutional, innate changes. In some cases, where the rock-record is very complete, it is possible to study the variations which occurred in the distant past. Thus, in ammonites and nautiloids, or in Gastropods like *Paludina* and *Planorbis*, the variations which lead on from one species to another have been studied with much success. In most cases, however, the rock-record is much too imperfect to admit of this, and it thus becomes of fundamental importance to discover as much as possible in regard to the variations occurring in nature at the present time. For it is only when we have certain knowledge that such and such variations do actually occur now, that we are justified in supposing that similar variations may have occurred in the past. With this study of variation, especially by the use of statistical methods, considerable progress has been made. Thus we know that variations are continually occurring, and that some forms are more variable than others; that the variations can, in many cases, be registered on symmetrical curves, so that the use of the word 'chance', except in its mathematical sense, is inappropriate; that it is common for an organism to vary, not in one particular feature by itself, but in many characters at once, as if it changed as a whole, and not piecemeal; that some variations are merely what may be interpreted as due to an incompleteness in the expression of the normal inheritance, while others are new departures; that some variations are very minute, the variant differing from its parent just as one stage of individual growth differs from its antecedent; that other variations imply changes of considerable magnitude, new structural arrangements appearing suddenly and with some measure of completeness, so that they may be said to be 'discontinuous' or 'transilient'; that some variations are disadvantageous and lead on to disease, while others seem from the first useful and adaptive to the conditions of life.

Directive Factors.—As we have seen, the raw

material of progress is found in the continual crop of variations, and, according to some, in the continual occurrence of modifications. But as it is not certain that modifications are transmissible, they must at present be left out of the evolution-scheme. It has been pointed out, however, that useful modifications may be of indirect importance in evolution by favouring the survival of those organisms which are plastic enough to acquire them until coincident congenital variations in the same direction may have had time to acquire strength and persistence. The adaptive modification, acquired by each successive generation afresh, may act as 'a screen to perpetuate and develop congenital variations and correlated groups of these'. But this requires to be substantiated by concrete instances. Similarly, we require a period of precise observation before we can form a secure judgment in regard to the scope and adequacy of the directive factors of evolution, which are summed up in the terms Natural Selection or Elimination, and Isolation. At present our view must depend on our conclusions as to three debatable subjects:—(1) the transmission of modifications or acquired characters, (2) the nature of variations and the proportion of these which are non-adaptive, and (3) the extent to which discriminative elimination occurs in the struggle for existence.

Natural Selection.—The 'struggle for existence' is a convenient formula for a certain aspect of animate nature. Most living creatures have a tendency to rapid increase; the results of this often come into conflict with the increase of their means of subsistence, or even with the limitations of space; a further result is the elimination of the many and the survival of the few. In other words, many members of a species have a shorter life, and leave fewer or less successful offspring, than others. The so-called 'struggle'—a term which must not be taken too literally—may begin before birth; for example, between the numerous possible egg-cells among which only a few may survive, or between the numerous spermatozoa, only a small percentage of which may survive in successful fertilization. And the struggle may, as Darwin said, continue on to the hour of death. There is a second fundamental reason for the struggle, namely, the variability of the physical environment—climate, weather, temperature, illumination, pressure, &c.—to which organisms are at the best only relatively well adapted. On these primary conditions of struggle others depend; for example, that one kind of organism naturally feeds upon another, or that there may be a disproportion between the numbers of the sexes, so that all cannot be mated. The struggle may be between the living creature and inanimate nature, between plants and animals, between one race of animals and another, between members of the same species, between rival males, . . . and so on till we come down to the germ-cells. The objects, too, are as diverse as the possible parties; they include especially (1) individual existence and well-being; and (2) the continuance of family and kin—both of them objects of great complexity. The degrees of intensity are not less diverse—from life-and-death struggle for bare subsistence to a rivalry in the pursuit of increased pleasure; but the intensity will mainly depend on the rate of reproduction and the variability of the environment. In short, the struggle for existence is a function of numerous, partly dependent, partly independent variables. It is a general technical expression of what occurs whenever the effectiveness of an organic response is of critical moment in relation to continuance and well-being.

The fact of elimination is obvious, the difficulty is to decide how far it is discriminative. The

occurrence of a storm may thin the ranks of an overcrowded community, but it cannot be assumed that the survivors do survive in virtue of the possession of particular characters. This has to be proved by careful comparison of the survivors and the eliminated, and it cannot be said that this has yet been done in a sufficient number of cases to give us the security we should wish to have in speaking of discriminate elimination or selection. The task is the more difficult since elimination does not necessarily mean immediate death, but may only mean a shorter or less vigorous life and fewer and less vigorous offspring. It is evident that when the farmer thins the turnip crop with rapid strokes of the hoe, he is for the most part an indiscriminating eliminator, though he may now and again pause to spare a particularly promising plant which happens to catch his eye. The theory of natural selection is based on the assumption (in some cases verified) of discriminate elimination, for the fundamental idea of the theory is that in the struggle for existence those forms are eliminated which are relatively unfit, the survivors being those which are varying in the direction of greater fitness or more perfect adaptation to the particular conditions of their life. It must be borne in mind that by the phrase 'survival of the fittest', evolutionists always mean the survival of the fittest relative to given conditions.

Isolation.—It has often been urged as an objection to the Darwinian theory, that particular variations of small amount would tend to be lost or neutralized by intercrossing. In his artificial selection the breeder takes measures to prevent this by isolation, but what is the factor in natural conditions? In answer to this objection, it has been suggested that numerous similar variations may occur at once, e.g. under the influence of a similar environmental stimulus. It may also be answered that the experience of breeders and cultivators shows that variations are by no means always readily swamped, even in the absence of isolation. Some new departures have a remarkable potency for persistence even when the conditions do not appear favourable. It is possible to conceive of a struggle for existence within the fertilized ovum, wherein the physical basis, corresponding, let us say, to a strongly-marked paternal variation, asserts its 'prepotency', and expresses itself in development through succeeding generations even without co-operation from a similar characteristic on the maternal side. But the answer which has been emphasized, especially by Romanes and Gulick, is expressed in the word *Isolation*. Under this term is included a variety of ways in which free intercrossing between members of a species is prevented, e.g. by geographical barriers, by changes of habit, by reproductive variations causing mutual sterility or incompatibility between two sections of a species living on a common area, and so on. There can be little doubt that isolation in some of its forms has been an important factor in evolution, but there is still lack of sufficiently precise evidence in regard to the supposed swamping without isolation, and in regard to the general prevention of free intercrossing.

Thus, at the present date, we are led to the conclusion that while the general conception of evolution stands more firmly than ever as a reasonable modal interpretation of organic nature, there is great uncertainty in regard to almost every question concerning the factors in the evolution process. It may also be noted, in conclusion, that the evolutionist's task is altogether a scientific one, and has in itself nothing whatever to do with ultimate problems. The evolutionist interpretation is not in the slightest degree a philosophy of nature, but an attempt to show how the present may be accounted for in

terms of the past by the intrinsic factors observed to be at work. Neither in this nor in any of his tasks does the scientific investigator seek after ultimate explanations. At some point or other he assumes to start with an original institution of the order of nature, in other words a creation, and at no point does he imagine that he is doing more than working out a formula to fit facts.

For introduction to the subject, see Shute's *First Book of Organic Evolution* (1899); Clodd's *Primer of Evolution, Story of Creation* (1888), and *Pioneer of Evolution* (1897); Thomson's *Science of Life* (1899) and *Study of Animal Life* (1892); Lloyd Morgan's *Animal Behaviour* (1900); Poulton's *Charles Darwin and the Theory of Natural Selection* (1896); H. de Varigny's *Experimental Evolution* (1892). For further study see Charles Darwin, *The Origin of Species* (1859), *Variation under Domestication* (1868), *The Descent of Man* (1871); A. R. Wallace, *Contributions to Theory of Natural Selection* (1871), *Darwinism* (1889); Herbert Spencer, *Principles of Biology* (1864-66); Ernest Hæckel, *Natural History of Creation* (1868); T. H. Huxley, *American Addresses* (1877); G. J. Romanes, *Darwin and After Darwin* (1892-97); A. Weismann, *Germ-Plasm* (1893); W. Bateson, *Materials for the Study of Variation* (1894); K. Pearson, *Grammar of Science* (1899). See HEREDITY, NATURAL SELECTION, SPECIES.

EVOLUTION, in mathematics, see INVOLUTION, ROOT.

EVORA (ancient *Ebura*) a town in Portugal, capital of the province of Alemtejo, on a height in the centre of a fertile plain, 80 miles east of Lisbon. It is an ancient place, the see of an archbishop, and famous for the defeat of the Moors by Gerard the Fearless in 1166. It is poorly built, and its walls, citadel, and forts are all in a ruinous state. Its most interesting objects are a Roman temple, a restored Roman aqueduct, a large and handsome cathedral, a Gothic structure, founded in 1186, the church of S. Francisco, the archiepiscopal library, the university, and the public garden. Pop. (1890), 15,134.

EVREMOND, or EVREMOND. See ST. EVREMOND. EVREUX (ancient *Civitas Eboracorum*), a town of France, capital of the department of Eure, in a fertile valley on the Iton, which branches so as to divide it into three parts, 67 miles W.W. of Paris. It is an ancient place, was sacked by the Normans in 892, and taken in 1119 by the English, who long retained possession of it. Its streets are narrow, but its houses well built. Its most remarkable objects are the cathedral, a very ancient but irregular Gothic structure, with fine old stained glass, carved woodwork, delicate iron-work, and a spire 256 feet high; the Romanesque church of the Abbey of St. Taurin, an ancient and lofty clock-tower, the bishop's palace, a town-house, museum, &c. The manufactures consist chiefly of bed-ticking, hosiery, and leather, and there are also bleacheries, dye-works, brick and tile works, flour-mills, &c. Pop. (1896), 13,052.

EWALD, GEORG HEINRICH. See SUPP.

EWALD, JOHANNES, Danish poet, was born at Copenhagen in 1743. At the age of fifteen he was sent to the theology classes of the Copenhagen University, but his inclinations were fixed on the military profession, and he ran away and enlisted in the Prussian service at Hamburg. Being compelled to join a regiment of artillery at Magdeburg, instead of being attached to the hussars, as he had been promised, he deserted the Prussian standard in the Seven Years' war, and entered the Austrian service, where he was not only better treated, but, having distinguished himself on several occasions, was promised promotion, on condition of embracing the Roman Catholic religion. This Ewald refused; and,

being bought off by his family, he returned to Copenhagen. He now began to apply himself seriously to theology. But a disappointment in love again interrupted his career; the world and life became odious to him, and he sank into despondency. He was then twenty-three years old, and was unconscious of the talent alumbering within him. An accident kindled the flame. On the death of Frederick V. of Denmark he was requested to compose an elegy (1766); and the general admiration with which it was received roused the ambition of the young man, who now, encouraged by the Academy of Copenhagen, protected by Bernstorff and Karstens, and assisted with the advice of Klopstock, then residing in Copenhagen, made rapid progress in his new career, and soon became one of the most eminent lyric and tragic poets of his nation. His opera the *Death of Balder* (1774), the subject of which is taken from the northern mythology, and his *Rolf Krage* (1770), a tragedy taken from the ancient history of Denmark, are works which, notwithstanding many defects, bear the impress of true genius; but by some his lyrical drama *The Fishers* (1779) is ranked as the finest of all his works. As a lyric poet he is most popular at the present day, and several of his odes and elegies are among the best that modern times have produced. He was irregular in his habits, suffered much from ill-health, and he died in poverty in 1781, scarcely thirty-eight years old.

EXANTHEMA, a kind of febrile disease, accompanied by an eruption on the skin. The name is usually restricted to those diseases of an infectious kind which are due to a specific poison operating on the blood, including typhus fever, small-pox, measles, scarlet fever, &c. They each appear at some definite interval after infection, and run a definite course. Exanthemata have each their own peculiarities as to origin, character of the eruptions, and continuance of the disorder.

EXARCHATE, the name of a province or territory of the Byzantine Empire under an *exarch* or viceroy. In the sixth century after Christ, Justinian formed the greater part of Italy into a province of the Eastern Empire, and gave the government of it to an officer called an *exarch*, Narses being the first to bear the title. The province, which was generally known as the *Exarchate of Ravenna* (from its capital), was soon greatly reduced in extent by the conquests of the Lombards, who latterly drove out the Byzantines altogether (in 751). Several years after, Pepin, king of the Franks, gave part of the exarchate to the pope. (See **CHURCH, STATES OF THE**.) *Exarch* was also the title of an ecclesiastical grade in the Greek Church inferior to the patriarchs, but superior to the metropolitans. The title is now given to a deputy of the patriarch, who travels about in the provinces, and visits the bishops and churches.

EXCAMBION, in Scots law, the name given to the contract by which one piece of land is exchanged for another. An heir of entail in possession may, without consent of any other heir, make excambion of a portion of the entailed estate for an equivalent in lands lying contiguous to the same, or convenient to be held along with it, all necessary forms being duly complied with. Excambion cannot be made of the principal mansion-house or offices, or the garden, park, home-farm, or policy of any entailed estate, nor of more than one-fourth in value of the entailed heritage.

EXCELLENCE, a title of honour differently applied at different times, now especially belonging to ambassadors and plenipotentiaries, governors of English colonies, &c.

EXCHANGE, a place in large commercial towns where merchants, agents, bankers, brokers, and others concerned in business meet at certain times for the transaction of business. Meeting-places for commercial purposes existed at an early date in Genoa, Venice, and other Italian cities. The modern institution of exchanges dates from the sixteenth century. They originated in the important trading cities of Italy, Germany, and the Netherlands, from which last-named country they were introduced into England. Previous to the latter half of that century the London merchants used to meet without shelter in Lombard Street. Sir Richard Gresham, having seen the covered walks used for exchanges abroad, contemplated a similar building in London. The scheme was carried into effect by his son Sir Thomas Gresham, who contributed the cost of the erection, the citizens paying for the site alone. On January 23, 1570, the building was formally opened by Queen Elizabeth, and received the name of the Royal Exchange. It was destroyed by the great fire of 1666, and its successor, opened in 1669, shared a like fate in 1838. The foundation-stone of the present structure was laid in 1842 by Prince Albert, and it was opened by Queen Victoria on October 28, 1844. It is an imposing edifice, embellished with numerous statues. The area appropriated to the meetings of the merchants is 170 feet by 112, of which 111 feet by 53 is uncovered. Portions of the building are occupied by the Royal Exchange Assurance Company, and by the still more famous 'Lloyd's'. The most celebrated continental exchanges are the *Bourses* of Paris and Amsterdam, the *Börse* of Hamburg, and in America the Stock Exchange in Wall Street, New York. In some exchanges only a special class of business is transacted. Thus there are stock exchanges, corn exchanges, coal exchanges, cotton exchanges, produce exchanges, &c. See **STOCK EXCHANGE**.

EXCHANGE, in commerce, that species of transactions by which the debts of individuals residing at a distance are cancelled without the transmission of specie. Thus, suppose a merchant in London orders his agent in Glasgow to send him £100 worth of cotton goods, and that it is not convenient for the agent to commission goods of equal value from his London correspondent, the latter may, notwithstanding, be under no necessity of remitting cash to Glasgow in discharge of his debt. Among places having a considerable mutual intercourse, the debts due by each other are generally found to be about equal. The Glasgow agent does not therefore transmit the bill drawn by him on his correspondent for the value of the cottons, to London to be cashed, as he would have to bear the expense of getting the money sent him; but he gets its value from some other party in Glasgow who has a payment to make in London (say for tea), and who, unless he could procure such a bill, would have had to remit the amount of his debt in money. The bill on account of the cotton is therefore either drawn in favour of the party in London who furnished the tea, or it is drawn in favour of the tea-dealer in Glasgow and indorsed by him to the former, who in presenting it to the purchaser of the cottons receives its value. This contrivance obviates the expense and risk both of transmitting money from London to pay the cottons and of money from Glasgow to pay the tea; and both accounts are settled without the intervention of a single farthing. The process of liquidating obligations arising between different nations does not differ essentially from those which regulate the traffic in bills of exchange between different towns of the same country; but it is affected by special circumstances to such an extent as to put the trade in foreign bills seemingly

into a different category from those of home circulation. When it is borne in mind that the trade in money, or securities representing the worth of money by expressing quantities of money, is liable in the fullest sense to competition, to the effect of supply and demand, and to other cognate economical forces, it will be easily seen that circumstances which tend to produce fluctuations in market rates will apply with the greatest significance to the trade in foreign bills, since a wider latitude is given in such securities for the influence of these exceptional events. When all the accounts of one country correspond in value with those of another, so that there is an even balance, the exchange will be at par, that is, the sum for which the bill is drawn in the one country will be the exact value of it in the other. But such a state of things can never exist in reality, and the rate of exchange is governed by the interposition of bills drawn on other countries where a similar inequality prevails, due to the fact that in these the inequality is reversed. Thus, in the trade between Italy and Britain the bills drawn on the latter country almost always amount to a larger sum than those drawn in Italy. The bill-brokers, however, by buying up the excess of the Italian bills on London and selling them in Holland and other countries indebted to England, prevent the *real* exchange from ever becoming greatly depressed. Fluctuations in the exchange have a tendency to correct themselves; they can never, in ordinary circumstances, for any lengthened period, exceed the expense of transmitting bullion from the debtor to the creditor country. When the exchange is favourable to one country it is also corrected by restricting exportation and facilitating importation; when unfavourable it produces the same effect by increasing exportation and diminishing importation. The true par forms the centre of these oscillations, and although the thousand circumstances which incessantly affect the state of debt and credit prevent the ordinary course of exchange from being almost ever precisely at par, its fluctuations are confined within narrow limits, and have a constant tendency to disappear. See BILL.

EXCHANGE, DEED OF, in English law, an original common law conveyance for the mutual transfer of real estate. It takes place between two contracting parties only, although several individuals may be included in each party; and the parties must take an equal estate, as fee-simple for fee-simple, legal estate for legal estate, copyhold for copyhold of the same manor, and the like. An exchange is null if either party dies before entering, as actual entry by the parties themselves is essential. The General Inclosure Act (8 and 9 Vict. cap. cxviii.) provides for the allotment and award of any land to be inclosed in exchange for any other land within the same parish, and enables the commissioners to effect exchanges upon the application of the parties interested in the lands proposed to be exchanged.

EXCHEQUER, in Britain, the department which deals with the moneys received and paid on behalf of the public services of the country. The public revenues are paid into the Bank of England (or of Ireland) to account of the exchequer, and these receipts, as well as the necessary payments for the public service, are under the supervision of an important official called the controller and auditor-general, the payments being granted by him on receipt of the proper orders proceeding through the treasury. The public accounts are also audited in his department.

EXCHEQUER, CHANCELLOR OF THE. See CHANCELLOR.

EXCHEQUER, COURT OF, an ancient court of record, established by William the Conqueror, and intended principally to order the revenues of the

crown, and to recover the king's debts and duties. The court consisted of two divisions, namely, the court of revenue, which ascertained and enforced the proprietary rights of the crown against subjects, and the common-law division, once subdivided into a court of equity and a court of common law, but by 5 Vict. cap. v. its equity jurisdiction was transferred to the court of chancery. It was one of the supreme courts of common law in England, and is said to derive its name from the chequered cloth, resembling a chess-board, covering the table of the court, and on which, when certain of the accounts were made up, the sums were marked and scored with counters. The judges of this court were the chief baron and five junior or *puisné* barons. From the court of exchequer an appeal lay in error to the court of exchequer chambers, where the judgments of each of the superior courts of common law (namely, the queen's-bench, common pleas, and exchequer), in all actions whatever, were subject to revision by the judges of the other two sitting collectively. This court is now a division of the High Court of Justice, and its practice in ordinary civil cases is the same as that of the other divisions.

The Scotch court of exchequer, prior to the Union, was the king's revenue court. It was continued by the nineteenth article of the Treaty of Union until a new court should be established, which was effected by 6 Anne xxvi. By 19 and 20 Vict. cap. lvi. this court is now abolished, and the jurisdiction transferred to the Court of Session.

EXCHEQUER BILLS, bills of credit, or promissory bills, issued by authority of Parliament. They are for various sums, and bear interest (generally from 1½d. to 2½d. *per diem* on £100) according to the current rate at the time. In 1696, when first issued, they were drawn for sums varying from £100 to £5, and bore interest at the rate of 8d. *per diem* on £100. During the Napoleonic wars the interest was as high as 3½d. These bills pass from hand to hand as money, and are accepted by the treasury at par, or by government as payment of taxes. The advances of the Bank of England to government are made upon exchequer bills, and the daily transactions between the bank and government are carried on by this means. Notice of the time at which exchequer bills are to be paid up is given by public advertisements. The amount outstanding usually amounts to about £5,000,000.

EXCISE may be said to be an inland duty or impost laid on commodities consumed, or on their retail, which is the last stage before consumption. Many articles, however, are excised at the manufacturing stage. The word seems to be derived from a Dutch term of similar meaning, which in turn may be of same origin as *assise*, its present form being influenced by a supposed derivation from Latin *excisus*, meaning 'cut out'. Down till the nineteenth century it was used to cover part of what is now known as customs. As in few countries the definitions of *excise*, *impost*, *custom*, &c., are scientifically settled, it is almost impossible to give a satisfactory explanation of excise applicable to all countries. Excise is either general, extending to all commodities; or particular, levied only on certain articles of consumption. The latter sort was introduced into Saxony at the diet of Leipzig as early as 1438, and extended in 1440 at the diet of Grimma; but a perfect system of general excise was first devised in France, and thence introduced into Holland soon after it had assumed a republican form of government, into the state of Brandenburg under the reign of the Elector Frederick William the Great, and into Saxony in the beginning of the eighteenth century.

Excise duties were introduced into England by

the Long Parliament in 1643, being then laid on the makers and vendors of ale, beer, cider, and perry. This form of duty was borrowed by the Puritan financiers from Holland, and was, of course, primarily imposed in order to meet the expenses of the civil war. It would appear, however, that in its first form it recommended itself to the Puritan rulers as a means of checking drunkenness, but in 1644 the urgent need of money caused the Parliament to impose excise duties on such articles as meat, salt, hats, starch, silks, &c. Three years later meat and salt were exempted. The royalists soon after followed the example of the republicans, both sides declaring that the excise should be continued no longer than the termination of the war. But it was found too productive a source of revenue to be again relinquished; and when the nation had been accustomed to it for a few years the Parliament declared in 1649 that the 'import of the excise was the most easy and indifferent levy that could be laid upon the people'. At the Restoration the imposition of excise duties was continued and reorganized. The excise was then divided into two parts, namely, the hereditary excise and the temporary excise. Of these the former was granted to the crown in place of certain feudal dues which were definitely abolished at that time, but the latter was merely voted to Charles II. for life. The temporary excise included duties on various intoxicating liquors, and on tea, coffee, chocolate, and other articles. Notwithstanding what Blackstone says, namely, that 'from its first original to the present time its very name has been odious to the people of England' (Com. book i. cap. 8), it has continued progressively to gain ground, and at this moment furnishes about two-sevenths of the entire public revenue of the kingdom. The former hatred of all duties bearing the name of excise was strikingly shown during the agitation against Walpole's famous Excise Bill, when the cry of 'Liberty, Property, and No Excise' was raised. The same feeling is reflected in Dr. Johnson's definition of excise as 'a hateful tax levied upon commodities; and adjudged . . . by wretches hired by those to whom excise is paid'. Excise duties were formerly imposed on leather, candles, salt, glass, hops, paper, &c., but spirits and beer are now the chief articles, in addition to which are licenses of various kinds. (See LICENSE.) The total revenue arising from excise in the year ending 31st March, 1900, amounted to £37,335,543, of which £32,100,000 was paid into the exchequer, the rest going to local taxation accounts. In 1849 the departments of excise, stamps, and taxes were amalgamated to form the Board of Inland Revenue, which has its head-quarters at Somerset House, London. The excise department of this board is directly under a chief inspector, assisted by an assistant chief inspector, several superintending inspectors, first-class inspectors, second-class inspectors, and a detective inspector. The United Kingdom is divided into collections, each of which is under a collector. These are again divided into districts, each district being under a supervisor; and the districts are further subdivided, the subdivisions being placed under inferior officers. The excise exercises strict control through its officers over distilleries and other manufactories of excisable goods. The taxes which constitute the *internal revenue* of the United States correspond to the excise in Britain. They were first levied in 1789, but did not yield a considerable sum till the war of 1812. After the war the internal revenue gradually declined, and in 1848 it ceased altogether. The great civil war which broke out in 1861 compelled the federal government to reimpose these duties, and

before long almost every industry was subjected to this form of taxation. Since then the internal revenue system has been continued, but it is now practically limited to taxation on fermented liquors, spirits, tobacco, oleomargarine, and banks.

EXCLUSION, BILL OF, a bill introduced into the British Parliament during the reign of Charles II. for the purpose of excluding the Duke of York, he being a Roman Catholic, from the throne.

EXCOMMUNICATION, literally, the excluding of a person from a society, and depriving him of its fellowship; ordinarily, the exclusion of a Christian from the church and church privileges. Some kind of excommunication has existed wherever religious societies have existed. The Jews practised excommunication, namely, an exclusion from communion in the benefits of religious worship with the people. In the early Christian church excommunication was exercised by the whole community. It was divided into a major or more severe form, and a minor or less severe. In the less severe form, it varied in effect from preventing an offender from receiving the eucharist to preventing him from entering the church. In the major form it debarred the offender from social intercourse with his fellowmen. By degrees the right of excommunication became confined to the bishops; and both in the Greek and Roman Catholic churches the subject of excommunication became more and more distinctly settled as to forms and effects. Excommunication was sometimes made use of by the popes as a political weapon against emperors, kings, and other potentates. Subjects were absolved from allegiance to their sovereign who lay under the greater excommunication, nay, were forbidden to obey him. But, in more modern times, many Roman Catholic ecclesiastical writers have maintained that, as an excommunicated private person is not prohibited by civil governments from managing his worldly affairs, so the excommunication of a prince ought not to have any influence on matters of political administration. Besides, the spirit of the age is such as not to allow an excommunication to have the same influence on the relations between princes and people as in the middle ages. At that time the pope excommunicated, or issued an interdict against, even whole cities, provinces, and countries. All religious services ceased; there was no regular burial, no ringing of the bells, &c. (See INTERDICT.) Many of the German emperors were excommunicated. The latest examples of sovereigns excommunicated are Napoleon I. in 1809, and Victor Emmanuel in 1860.

According to modern Roman Catholic authorities 'the major excommunication deprives of all ecclesiastical communion, and is equivalent in substance to *anathema*, from which it only differs in regard to the formalities by which the latter is surrounded. . . . Those under major excommunication again fall into two classes: *tolerati*, whom the faithful are not bound to avoid; and *non tolerati* (i.e. those excommunicated by name and publicly denounced, and those notoriously guilty, by themselves or others, of violence to clerics), with whom the faithful are forbidden to hold either religious or civil communion. Civil intercourse is, however, permitted for the sake of the faithful themselves under various circumstances and to various persons.' The minor excommunication may be incurred by communicating with a person under the major excommunication, its chief effect being exclusion from participation in the sacraments. Excommunications are also classed under the heads *ferenda sententia* (judgment to be passed) and *lata sententia* (judgment passed). In the former case a person renders himself liable to

be formally declared excommunicated; in the latter, he is by his very act (*ipso facto*) excommunicated and brought under the ban of the church. (See *Addis and Arnold's Catholic Dictionary*.)

In Germany, excommunication is nowhere practised at the present time among Protestants. In the Church of England, both the less and the greater excommunication are recognized (the bishops having the right of pronouncing the sentence), but since 53 Geo. III. cap. cxxvii. have had no civil consequences of any moment, and may now be considered to have no practical influence except in ecclesiastical matters. In Scotland, immoral conduct among the members of most religious bodies may produce exclusion from church privileges. What is called the greater excommunication may be formally pronounced by a presbytery against an unrepentant sinner, who is declared to be excommunicated and debarred from church privileges. But excommunication is rarely heard of in the United Kingdom.

EXE a river of England, which rises in Exmoor, in the county of Somerset, then flows through Devonshire, and after a southerly course of about 50 miles falls into the English Channel at Exmouth, by an estuary navigable for 8 miles to Topsham. Its chief tributaries are the Barle, Culm, Creed, and Clist. The principal places on its banks are Exeter, Tiverton, and Bampton.

EXECUTION, in law, is a judicial writ grounded on a judgment of the court by which the execution is issued, and is granted for the purpose of carrying the judgment into effect, being an order in the name of the supreme power of the state, or the executive branch of the government, attested by the court, to the sheriff, marshal, or other officer to whom it is directed, to cause the judgment of the court to be executed; as that a debt shall be levied against one party in favour of another; or that a punishment shall be inflicted, which has been awarded after due trial and conviction of the accused. Execution is granted by a court only upon the judgments given by the same court, not upon those pronounced by another; for where satisfaction of a judgment given by one court is sought in another, a trial must be had in such other, and a new judgment there given, on which execution issues. Executions are of various descriptions, according to the kind of satisfaction ordered, as a *capias ad satisfaciendum*, or an arrest for giving satisfaction, by which the sheriff, &c., is ordered to arrest and imprison the party against which it is issued as satisfaction of a judgment debt; but imprisonment for debt, except in a few cases, was abolished by 32 & 33 Vic. c. 62, so that this kind of writ is now seldom made use of; a *fiery facias*, by which a command is given to the sheriff that the amount of the debt be made of the goods and chattels of the party against which the execution is issued (with interest at 4 per cent from the time of entered-up judgment), for the satisfaction of the same; an *elegit*, by which the judgment is ordered to be satisfied by the sheriff giving over to the judgment creditor the lands and tenements of the judgment debtor to be held till the money due on the judgment is fully paid (the creditor being called tenant by *elegit* while he holds such lands and tenements); and a *habere facias possessionem*, by which a successful plaintiff in a case of ejectment is put in possession of the premises recovered. The wearing apparel and bedding of a judgment debtor, and the tools and implements of his trade, the whole not exceeding £5 in value, are exempt from seizure in execution. The order issuing to an officer to execute a judgment given on an indictment varies according to the penalty inflicted by the law for the crime or delinquency of which the party is convicted.

EXECUTION. See CAPITAL PUNISHMENT.

EXECUTIONER, the official who carries into effect a sentence of death, or inflicts capital punishment in pursuance of a legal warrant. In England it is the province of the sheriff to execute the extreme sentence of the law, but in practice the disagreeable duty is performed in his presence by an officer retained for this purpose. In Scotland the duty devolves upon the civic magistracy, but the strict letter of the law is avoided as in England by the attendance of a magistrate to witness the proceedings. Several executioners have become famous from their names being dragged into literature; such as Richard Brandon, the supposed headman of Charles I.; Jack Ketch, commemorated by Dryden (*Epilogue to the Duke of Guise*), whose name was long vulgarly given to all who succeeded him (in London) in this odious office. In the good old times almost every considerable town or county had its special executioner, but it is found that nowadays one man is able easily to overtake the whole business of the kingdom in this department.

EXECUTOR, in law, is one appointed by a man's last will to carry its provisions into execution after the testator's death. The testator may, by the English law, appoint any person of sound mind and discretion, though under some legal disabilities as to contracting and transacting business in general, such as a married woman, or a minor. The duties of executors and of administrators are, in general, the same; the difference of the two depending mostly on the mode of appointment, the executor being nominated by the testator, the administrator being appointed by the judge of probate; and often an administrator is appointed to administer upon an estate under a will, as where the testator does not name an executor, or where the executor named declines, or where the executor or administrator first assuming the trust has died, or is discharged by the court. Where administration on the estate has once been granted and commenced, and before it is completed, a new appointment is necessary, the person so appointed is called an *administrator de bonis non*, 'with the will annexed', if there be a will. The administrator with the will annexed assumes the duties that would have belonged to the executor if one had been appointed, or if the one appointed had acted, or had continued to act. Though a testator is at liberty to appoint any person to be his executor, with some few exceptions, the judge of probate is restricted, in the appointment of an administrator, whether it be the one on an estate of a person dying intestate, or 'with the will annexed', and whether it be the one originally appointed or the one appointed *de bonis non*; for the widow and nearest of kin to the testator have a right to the appointment, unless they are under some legal disability. The statutes more generally provide that the nearest of kin of the age of twenty-one shall have the administration, either jointly with the widow, if there be one, or on her declining, or on there being some legal objection to her appointment. By other statutes on this subject it is left to the discretion of the judge of probate, of the orphan's court, or of the magistrate, whoever he be, having this jurisdiction, to appoint either the widow or the next of kin. The principal creditors of the deceased are next entitled to this appointment. But a liberal discretion is generally vested in the magistrate as to this appointment. The same judge who appoints the administrator has the power of revoking the appointment.

An executor *de son tort*, that is, an executor of his own wrong, is one who meddles with the administration of the goods of a person deceased without any authority so to do, and he is accordingly answerable

to the rightful executor, or administrator, when one is appointed. It is the duty of an executor or administrator, after the will is proved, if the estate is to be administered under a will, to give notice of his appointment, make an inventory of the estate, and return it to the probate office or court; to take care of the personal property of the deceased, and see that it is not wasted; to collect the debts due to the estate; and finally, to distribute the effects or their proceeds among the creditors until their demands are paid, and then among the heirs and legatees, according to the directions of the will of the deceased, or according to the dispositions of the law, in case of its being the estate of a person dying intestate, or what is called, in the civil law, an estate *ab intestato*. In collecting the effects and debts, and so in investing the proceeds pending the administration, the executor or administrator, for the most part, acts according to his own discretion; but in making a distribution of them among the heirs or legatees he is particularly directed by the judge of probate. In the former case he accordingly acts at his peril, and is liable, as are also his sureties, for his managing the estate with proper discretion; but in distributing the effects and proceeds he acts under a judicial decree, and so is secure from any personal liability. In Scotland an executor to a will is called a *testamentary* executor, in contradistinction to the next of kin, who are called executors; an executor appointed by will is styled executor *nominate*, and by authority of the court executor *dativo*.

EXEGESIS, the interpretation of the Scriptures. The science which lays down the principles of the art of sacred interpretation may be called *exegetics*; though it is also designated by another name, *hermeneutics*. As the sacred books were composed by authors of a distant age and country and in foreign languages, it is evident that, in order to understand them, it is necessary to have not only a profound knowledge of the languages, but also a mass of historical, geographical, and antiquarian knowledge; and as the knowledge of Christian doctrine must be drawn from the Scriptures, it follows that the whole study of theology must proceed from exegesis. The most celebrated exegetic authors among the church fathers were Origen, Chrysostom, Theodoret, Diodorus of Tarsus, and Jerome. In the middle ages, when people confined themselves almost exclusively to the Vulgate or Latin translation, which was in common use, and most of the theologians were ignorant of the original languages, exegesis was very much neglected. But the study was revived by the Reformation, and within the last century or so there have been a multitude of eminent exegesists, particularly in the Protestant Church, and especially in Germany.

EXETER (Latin, *Ioca Damnoniorum, Ezonia*), a city, seaport, and county, par., and municipal borough of England, in the county of Devon, on the left bank of the Exe, 10 miles N.W. from its outlet in the English Channel, on the Great Western and London and South-Western Railways. It is pleasantly situated on the summit and slopes of an acclivity rising from the river, over which, at the west entrance to the city, is a handsome stone bridge. Two principal streets cross each other at right angles, from which a number of smaller diverge. Though still presenting many indications of antiquity, the city can now boast of as handsome squares, terraces, streets, and houses, all of modern erection, as any other in the kingdom. The principal object of interest is the cathedral, a noble edifice of high antiquity. It is cruciform, 408 feet in length, and consists of a nave, with two side aisles; two short transepts formed out of two heavy Norman towers,

each 180 feet in height; a choir of the same width as the knave, and 125 feet in length; ten chapels or oratories, and a chapter-house. The west front is richly decorated, presenting one of the most picturesque façades of any building in the kingdom, perhaps in Europe. The interior, now restored by Sir G. Gilbert Scott, is magnificent. Other architectural antiquities are the remains of the castle of Rougemont, portions of the ancient city walls of Athelstan, Norman work in some of the churches, and the noble guild-hall, tastefully restored. Among several fine modern churches St. Michael's may be mentioned. Among the numerous educational establishments is the Exeter school, founded by the citizens in the time of Charles I., to which there are a number of free scholarships. It has sixteen exhibitions to either of the Universities of Oxford or Cambridge. The Exeter Diocesan Training College is also situated in the city. The charitable institutions of various kinds are numerous. They comprise the Devon and Exeter Hospital, many almshouses, a dispensary, a lunatic asylum, a deaf and dumb institution, a penitentiary, an eye infirmary, a lying-in charity, a humane society, a stranger's friend society, &c. The principal scientific and literary institutions are—the Devon and Exeter Institution for the Promotion of Science, Literature, and the Arts, established in 1817, and possessing a valuable library; the Exeter Literary Society, established in 1835; and the Royal Albert Memorial College, Museum, and Free Library, whose enlarged buildings were opened in 1899. The college has over 1000 students. Exeter is not an industrial town, its woollen manufacture, once one of the largest in England, being extinct; but it has iron-foundries, manufactories of agricultural implements, paper-mills, corn-mills, tanneries, &c. Glove-making and lace-making are also carried on. By means of a canal, 5 miles in length and 15 feet in depth, vessels of 400 tons can reach the city, and there is a large floating basin. The Exe itself is not navigable to the city. Exeter is a place of remote antiquity, having been a British settlement long prior to the invasion of the Romans, by whom it was called *Ioca Damnoniorum*. It is spoken of by this name both by Antoninus and Ptolemy. A number of coins, small bronze statues, some tessellated pavements, and other Roman antiquities, have been found in the immediate vicinity of the city, showing that it had been an important Roman station. The number of its religious establishments was at one time so great that the Saxons called it Monkton. The city long returned two members to Parliament, but lost one in 1886. Pop. (1891), mun. bor., 37,580; par. bor., 50,570; (1901), co. bor., 46,940; par. bor., 53,141.

EXETER COLLEGE, OXFORD. This college, originally called Stapledon Hall, was founded by Walter de Stapledon, bishop of Exeter, sometime Lord High-treasurer of England, who removed to this place his scholars from Hart Hall, and made a foundation for a rector and twelve fellows. In 1404 Edmund Stafford, bishop of Exeter, added two fellowships and obtained leave to give the college its present name. In 1565 Sir William Petre, secretary of state, added eight; in 1636 Charles I. annexed one for the islands of Jersey and Guernsey, and lastly, Mrs. Shiers left certain rents in 1770, out of which two fellowships were founded. Under the authority of 17 and 18 Vict. cap. lxxxi. the fellowships (a number of which were appropriated to various archdeacons or counties) were reduced from twenty-five to fifteen, and were thrown open; they are now twelve in number. From the revenues of suppressed fellowships over twenty scholarships were founded, eight of which (called Stapledon scholarships) are

limited to persons born or educated in the diocese of Exeter, and one or more to persons born in any of the Channel Islands, or educated at Victoria College, Jersey, or Elizabeth College, Guernsey.

EXETER HALL, a large building on the north side of the Strand, London, opened in 1831. It is capable of containing over 3000 persons. In it the 'May Meetings' of the several religious societies are held. It is now the property of the Young Men's Christian Association.

EXHAUSTIONS, METHOD OF. The ancient geometers employed the method of exhaustion for determining the areas of curves, and for the solution of similar problems. The method consists in comparing the magnitude to be determined with rectilinear magnitudes; thus, the area of a curve with the area of a polygon constructed so as to be comparable with the curve in question. The use of the method is exemplified in the second proposition of Euclid's Twelfth Book, in which it is shown that the areas of circles are proportional to the squares of their diameters. This is proved by successively inscribing in the circles regular polygons of 4, 8, 16, &c., sides, thus tending to exhaust the area of the circles; it is then shown that by inscribing a polygon of a sufficient number of sides in the circle, the area of the polygon may be made to differ from that of the circle by less than any assignable quantity: and since the areas of similar regular polygons inscribed in circles are to each other as the squares of their diagonals, it is argued that the areas of the circles themselves bear the same ratio. The method was applied with all the rigorous logical exactness for which the Greek geometers are so famous.

EXHIBITION, an endowment or benefaction, consisting in an annual money payment settled for the maintenance of scholars in the universities of England and America. In Scotland such benefactions are called *bursaries*.

EXHIBITION, in Scots law, a term applied to an action raised with the view of compelling the production or delivery of writings. There are two cases in which this form of action is still resorted to, the first where the pursuer is the owner of the writings in the possession of the defender, and the second, where an apparent heir wishes to force production of writings relative to his predecessor's estate, that he may satisfy himself as to the propriety of actually entering as heir, and thereby incurring responsibility for his predecessor's debts and obligations. This action was formerly also resorted to where a fact pertinent to a cause in action had to be proved by writings in the possession of a third party, but for this purpose it is now disused, other processes being adopted to serve the same end.

EXHIBITION, INDUSTRIAL. The promotion of trade and manufactures by means of collections of works of industry and art has no claim to the merit of novelty. In modern times, however, the idea has been more systematically carried out, and was probably suggested by the good effects produced by two institutions of a like nature—the galleries of rare productions of art or nature collected by the wealthy and educated, and the exposure for sale of ornamental and useful articles in the stores of individuals, and more particularly on a large scale at the great fairs which in former times were more important features of commercial enterprise than they now are. These two methods of bringing together objects of all kinds operated powerfully upon each other, and while the wares of the manufacturer derived a higher tone of beauty and refinement from the exquisite forms and colours in the collections of the wealthy, the latter received fresh accessions of artistic productions from the merchant and craftsman, and demanded from

the artisans articles displaying greater art and more cultivated taste. The beneficial effect thus derived from the exhibition and comparison of the manufactured products of different localities could not long escape notice. In England this knowledge was brought to practical purposes in the eighteenth century, when the Society of Arts in 1756–57 not only offered prizes for specimens of manufactures, as carpets, tapestry, porcelain, &c., but exhibited the works of the competitors. In France an exhibition embracing all kinds of manufactures was held in the year 1798, and another under the consulate of Bonaparte in 1802, and the gratifying results attained led to the idea of holding them every three years, which was carried out as far as the political troubles of the country would allow. Many exhibitions were subsequently held at different cities on the continent of Europe, and in the British Islands exhibitions of a more or less local nature were held in Dublin, Manchester, Liverpool, and Birmingham, as well as in London in the premises of the Society of Arts. All these had been generally successful, but the necessity of having an exhibition on an international scale had become with some a fixed idea. This was first brought fairly before the British public in 1848 by Prince Albert, then president of the Society of Arts. In 1849 the project for an exhibition in which all nations might join began to take a tangible shape; and it was at last determined by government to issue a royal commission to deal with the matter, which was gazetted 3d January, 1850. The better to enable the commissioners to enter into contracts and otherwise incur obligations subscriptions were procured to a guarantee fund, the queen leading the list with £1000. A vast structure of iron and glass, generally designated the Crystal Palace, built from the design of Mr. (afterwards Sir) Joseph Paxton, was erected in an incredibly short space of time in Hyde Park, London, and was opened by her majesty on the 1st of May, 1851. The extreme length of the building was 1851 feet, the width 408, and the height about 64 feet. The entire area was about 19 acres. In the ground-floor and galleries there were about 8 miles of tables set apart for the exhibitors. The articles sent for exhibition were divided into four great sections:—Raw Materials, Machinery, Manufactures, and Fine Arts. The number of exhibitors was about 15,000. The exhibition remained open until the 11th October, and the number of visitors during the 144 days amounted to about 6,170,000. The money drawn for admission amounted to £505,107, and after all expenses were defrayed there was a balance of £150,000 left over. Exhibitors and visitors from all parts of the world assembled in the magnificent crystal palace. When the exhibition was over, the building was taken down, and a great part of the material was used in the Sydenham Crystal Palace, still one of the sights of London. The immense success of the undertaking encouraged the local and national exhibitions of Dublin and New York in 1853 and of Munich in 1854; and the French nation in 1855 opened its first Exposition Universelle. The main building was an imposing structure of white stone and of classic architecture, the interior completed with wrought and cast iron, and with glazed vaulting. Connected with the main building was a long and straight annex containing the exhibition of raw materials, machinery in motion, &c. Another annex contiguous to, but not connected with these, was dedicated to the fine arts of the civilized world. The buildings were erected in the Champs Elysées, and covered about 24 acres. There were in all about 24,000 exhibitors, and the contents were pronounced greatly in advance of those exhibited in London in

1851. It was said that continental manufacturers had taken lessons from the British exhibition which the British had failed in fully profiting by, and so exhibited a vast improvement in works in which the latter considered themselves unrivalled. This was followed by the national exhibitions of the Dutch at Haarlem and the Belgians at Brussels, both in 1861, and the following year by the second great international exhibition held in London. It occupied a vast brick building, lighted by a roof and two immense cupolas of glass, designed by Captain Fowke, R.E., and erected in the garden of the Horticultural Society at South Kensington. The space covered was about 17 acres. There were 26,348 exhibitors in the industrial division, of whom 8487 were British, and in the fine art division 2805, of whom 990 were British. The aggregate number of visitors from 1st May to 31st October was 6,211,103, giving an average of 36,328 per day. The money taken for admission amounted to £328,858, and the entire cost of the undertaking to £321,000. The productions, which came from almost all parts of the globe, were divided into forty classes, and included manufactures of all kinds—machinery, chemical products, railway plant, and ordinary vehicles, animal and vegetable products used in food or manufacture, architecture, painting, sculpture, engraving, &c. &c. This exhibition was also eminently successful, and enabled the public to judge of the progress or shortcomings of British home manufactures and art as compared with others. In 1865 a rather important exhibition was held in Dublin, which was successful in all respects but one—it was a pecuniary failure. The second French International Exhibition was opened on the 1st April, 1867, and closed on the 3rd November. It was a rather unsightly building, deserving the descriptive name of gasometer given it by the Parisians themselves, was erected on the marshy Champ de Mars, covering about 37 acres, and contained the works of nearly 50,000 exhibitors. The building was divided into twelve concentric circles, with a small open garden in the centre. The outer circle was devoted to machinery of all kinds; then followed metallurgy, chemistry, dyeing, &c.; next came textile materials, clothing, furniture, jewelry, plate, porcelain, &c.; then matters relating to education; then the collection of fine arts; and, lastly, an archaeological collection from each country, showing the rise and progress of industrial art. On the 1st of May, 1871, the first of the British annual international exhibitions of fine arts and industry was opened by the Prince of Wales. The buildings, situated on the east and west side of the Horticultural Society's gardens, are 1100 feet long on the ground-floor, and on the upper floor 600 feet. The width throughout is 30 feet, and the height of the two floors 60 feet. The buildings are in the decorated Italian style, with mouldings, cornices, columns, and courses in buff coloured terra-cotta. The main part of the structure is of red Farnham bricks. On the 1st May, 1878, the first Austrian international exhibition was opened by the Emperor Franz Josef with great pomp and ceremony. The building was situated in the Prater, or, as it may be called, the park of Vienna, and was 2940 feet in length, with an average breadth of 570 feet. A great exhibition was opened by President Grant at Fairmount Park, Philadelphia, upon the occasion of the centennial festival of the American declaration of independence. It occupied 60 acres, and had nearly 10,000,000 visitors. A third French International Exhibition was held at Paris in 1878; area occupied 140 acres; visitors 17,000,000. A fourth French International Exhibition was opened by President Carnot in 1889 to commemorate the centenary of the Revolution, the visitors to which numbered

over 25,000,000. One of its chief features was the Eiffel tower, of iron, 984 feet high. The series of exhibitions which were held at South Kensington, London, included The Fisheries (1883), The Health (1884), The Inventions (1885), and the Exhibition of Colonial and Indian products (1886); the latter of which was visited by 5,550,749 visitors. Besides these, exhibitions have been held in Edinburgh (1886), at which there were 2,769,632 visitors; Manchester (1887), at which there were 4,765,000 visitors; and Glasgow (1888), with 5,748,379 visitors. A great World's Fair, on an enormous scale, was held in 1893 at Chicago. In 1900 a huge International Exhibition was held at Paris, but, though visited by about 47,000,000 persons, was not a financial success. The Glasgow International Exhibition of 1901 was visited by over 11,000,000 persons.

EXILE, a punishment by which a person is compelled to leave the city, province, or country in which he has previously resided. It amounts, therefore, to a civil excommunication or political proscription. It is a punishment for state criminals. The ancient republics sometimes exiled men on mere suspicion that they might become dangerous to republican liberty (by the ostracism). Many anticipated the sentence of the judges and went into voluntary exile.

EXMOOR, a wild and hilly district in the extreme south-west of Somersetshire, extending also into Devonshire. It was formerly a forest, but, with exception of a considerable portion lately taken into cultivation, it is now mostly heath and marsh. It embraces ranges of hills of considerable elevation (the loftiest being Dunkerry Beacon, 1707 feet), and in the time of the Druids was a favourite spot for the celebration of their religious rites. Red deer still exist here in a wild state.

EXMOUTH, a small town of England, in the county of Devon, 10 miles S.E. of Exeter, on the east side of the entrance to the estuary of the Exe, picturesquely situated, and forming one of the handsomest and most fashionable sea-bathing places on the south coast of Devonshire, while it also carries on a small shipping trade. In the lower and older parts of the town the streets are narrow, and the houses irregularly built; but the modern portions are composed mostly of streets or terraces of good houses, mansions of considerable size, and detached villas. There are numerous pleasant promenades, one of which is tastefully planted with trees, and commands a beautiful view of the opposite shores of the estuary. Below the town is a gradually sloping sandy beach, well adapted for bathing. Exmouth has an abundant supply of excellent water, and an extensive sewage scheme has been carried out by the local authority. Exmouth is said to have been one of the principal ports of the county in the reign of Edward III., although it had subsequently dwindled down to a mere fishing hamlet. It has a branch of the London and South-Western Railway from Exeter, and docks have lately been constructed. The South Devon Railway also passes close by the estuary of the Exe, on the opposite or west side. Pop. (1891), 8097; (1901), 10,487.

EXMOUTH, EDWARD PELLER, Viscount, a distinguished naval officer, born on the 19th April, 1757. He went to sea at the age of thirteen, the ship in which he began his career being the *Juno frigata*, and his first voyage was to the Falkland Islands. He was not engaged in active service till 1776, on the breaking out of the American war, when, being sent out as midshipman in the *Blonde frigate*, he greatly distinguished himself (at Lake Champlain) in the course of that and the following year. On the surrender of the British force, after the battle of Saratoga, he returned on his parole to England, and was soon after appointed first lieutenant of the *Apollo*

frigate, under Captain Pownall. In the midst of an action fought in the spring of 1780 the captain fell wounded in Lieutenant Fellow's arms, who thereupon assumed the command of the ship, and soon compelled the enemy to take safety in flight. For his conduct on this occasion he was promoted to the command of the *Hamard* sloop of war, from which in March, 1782, he was removed to the *Pelican*. A few months after he was raised by Admiral Keppel to the rank of post captain for a very spirited attack near the Bass Hook in the Frith of Forth on three of the enemy's privateers, all of which he drove on shore. On the breaking out of the war of 1798 he was appointed to the command of the frigate *La Nymphe*, of thirty-six guns, in which he sailed from Falmouth on the 17th June, and the next day captured the French ship *La Cléopâtre*, after a sharp struggle. For this achievement he received the honour of knighthood. Twice, when captain of the *Winchelsea* frigate, his heroic spirit was signally displayed by his leaping from the deck, and thus saving two of his drowning sailors. A more conspicuous example of this noble feeling was shown on the 26th January, 1796, when, by his great personal exertions, he preserved the crew and passengers of the *Dutton* transport, which, crowded with troops and their families, proceeding on the expedition to the West Indies, was driven on the rocks under the citadel at Plymouth. All the officers had left the vessel, and Sir Edward caused himself to be hauled on board with a rope, established order, and did not leave the ship until every soul was saved. From this time till the peace in 1802 Sir Edward was employed in active service, and shared largely in the success which attended the naval arms of his country. On coming home after the peace he was returned to Parliament as member for Barnstaple. The resumption of hostilities, however, soon called him again abroad. In 1804 he was sent to take the chief command on the East India station, in the *Culloden*, of seventy-four guns; and here he remained till 1809, when he had attained the rank of vice-admiral. A few months after his return to England he was again sent out as commander-in-chief of the fleet then blockading the Scheldt, and assisted in various operations of importance till the peace of 1814. Among the promotions which were made on that occasion Admiral Fellow was elevated to the peerage by the title of Baron Exmouth, with a pension of £2000 per annum. He also received the riband of the Bath, and a year after the grand cross of that order. In 1816 he proceeded to Algiers in command of a combined fleet of twenty-five English and Dutch ships to enforce the terms of a treaty regarding the abolition of Christian slavery which the dey had violated. He bombarded the city for seven hours, and inflicted such immense damage, destroying all the Algerine fleet and many of the public buildings, that the dey consented to every demand. Twelve hundred Christian slaves were by this exploit restored to liberty. The dignity of viscount was the well-merited reward which Lord Exmouth received for this important service. In 1821 he retired into private life, passing the greater part of his time at his beautiful residence at Teignmouth, where he died on the 23d of January, 1838.

EXODUS, the name given in the Septuagint to the second book of the Pentateuch, because it describes the departure of the Israelites from Egypt. The contents of the book, though not embracing such a variety of incidents as Genesis, are of a more diversified character, being not only historical, but also, and in a greater part, legislative. The subject-matter, arranged according to historical order, forms three divisions: 1. The condition of Israel in Egypt, and the preparations for their departure (ch. i-xii.

35). 2. The march from Rameses to Mount Sinai (ch. xii. 37-xix. 2). 3. The abode in the desert and the promulgation of the Sinaitic Law (ch. xix. 8-xi.) Various arguments against the credibility and authenticity of the book have been given to the public; we can only mention one or two. By adhering to the scriptural chronology a longer period than 215 years cannot be given as the residence of the Israelites in Egypt, it is therefore maintained that the 'three-score and ten souls' who accompanied Jacob to Egypt could not in that time have increased to about 2,500,000, which is calculated to be the total of a population embracing '800,000 men, besides women and children.' It is also maintained that there are traces of two different writers in the book, the Elohist and the Jehovist, as in other parts of the Pentateuch.

EXOGENOUS PLANTS, an older name for dicotyledons, having reference to the mode of growth of the stem. Monocotyledons are known as *endogenous plants*, or *endogens*. See BOTANY.

EXORCISM. An opinion prevailed in the ancient church, that certain persons, those particularly who were afflicted with certain diseases, especially madness and epilepsy, were possessed by evil spirits. Over such persons forms of conjuration were pronounced, and this act was called *exorcism*. There were even certain men who made this a regular profession, and were called *exorcists*. In the third century an idea began to prevail that heathens and heretics were possessed by demons, and hence exorcism was joined with the act of baptism. From a supposed accordance with the doctrine of original sin, as explained by St. Augustine, exorcism was introduced in the baptism of infants. Luther allowed the custom to be retained; the Calvinistic Church early discarded it; many of the Lutheran clergy, even in the sixteenth century, also disapproved of it. It continued, however, in the Lutheran Church till modern times. It is now almost universally done away with among Protestants. The Catholic Church has ordinary exorcisms, as those used in baptism and in the benediction of the water; and extraordinary ones, those which are used to deliver possessed persons, to abate storms, to kill obnoxious animals, as the vermin which destroy the fruits of the earth. It is by no means, however, an idea which arose in the Christian church. All the ancient pagans, and also the Jews, acknowledged the efficacy of exorcism.

EXORCIST. The members of one of the lower orders of Catholic clergy are called by this name.

EXOSMOSE. See OSMOSIS.

EXOTERIC. See ESOTERIC.

EXOTIC, an appellation for the produce of foreign countries. Exotic plants are such as belong to a soil and climate entirely different from the place where they are raised, and therefore can be preserved for the most part only in green-houses. Exotic plants of the hot climates are very numerous in this country, and require the utmost attention of the gardener.

EXPANSION, in physics, is the enlargement or increase in the bulk of bodies, in consequence of a change in their temperature. (See HEAT.) This is one of the most general effects of heat, being common to all bodies whatever, whether solid or fluid. The expansion of solid bodies is determined by the pyrometer, and that of fluids by the thermometer. The expansion of fluids varies considerably, but, in general, the denser the fluid, the less the expansion; thus water expands more than mercury, and spirits of wine more than water; and, commonly, the greater the heat, the greater the expansion; but this is not universal, for there are cases in which expansion is produced, not by an increase, but by a diminution of

temperature. Water furnishes us with the most remarkable instance of this kind. Its maximum of density corresponds with $39^{\circ}2$ of Fahrenheit's thermometer. This fact is not only curious in itself, but is also of the utmost importance in the economy of nature. When the surface of rivers and lakes is cooled, the superior layer of water sinks, and warmer water from below takes its place till the whole mass is cooled to 40° . After this the circulation ceases, and ice is formed only on the top. Any further cooling that takes place goes to produce more and more ice at the surface, and it is seldom that the temperature near the bottom of a lake or sea of any considerable depth falls sensibly below the maximum density point. Animal life would not, under other circumstances, be preserved during the cold of winter. The maximum density point of sea water is considerably lower than that of fresh water, and varies with the quantities of the salts contained in it. The expansion of water is about the same for any number of degrees above or below the maximum density point. Thus, if we heat water 5° above $39^{\circ}2$, it occupies the same bulk as it does when cooled down to 5° below $39^{\circ}2$; and the density of water at 32° and at 58° is very nearly the same. The prodigious force with which water expands in the act of freezing is shown by glass bottles filled with water, which are commonly broken in pieces when the water freezes. A brass globe, whose cavity is an inch in diameter, may be burst by filling it with water and freezing it; and the force necessary for this effect is 27,720 lbs. weight. The expansive force of freezing water may be explained by supposing it the consequence of a tendency which water in consolidating is observed to have to arrange its particles in one determinate manner, so as to form prismatic crystals, crossing each other at angles of 60° and 120° . The force with which they arrange themselves in this manner must be enormous, since it enables small quantities of water to overcome so great mechanical pressures. This observation is conspicuously illustrated by observing the crystals of ice on a piece of water exposed to the action of the air in frosty weather; or upon a pane of glass in a window of a room without a fire at the same season. Various methods have been tried to ascertain the specific gravity of ice at 32° ; that which succeeded best was to dilute spirits of wine with water till a mass of solid ice put into it remained in any part of the liquid without either sinking or rising. The specific gravity of such a liquid is 0.92, which, of course, is the specific gravity of ice, supposing the specific gravity of water at 60° to be 1. This is an expansion much greater than water experiences even when heated to 212° , its boiling-point. We see from this that water at the instant of solidification receives a sudden and considerable augmentation of bulk.

EX PARTE, a law Latin term, meaning literally, 'all from one side,' and applied to evidence or pleadings, which, being untested as yet, is to be viewed with doubt or distrust. A commission *ex parte* in chancery is that which is taken out and executed by one party alone, the other refusing or neglecting to join.

EXPECTORANTS, in pharmacy, medicines which promote expectoration. Such are the stimulating gums and resins, squills, &c.

EXPECTORATION, the act of evacuating, or bringing up phlegm, or other matters, out of the trachea and lungs, by coughing, &c.

EXPENSES, or **COSTS OF SUIT** (in Scotland), are terms applied to the charges exigible from a party to an action, as court dues, fees to counsel and agents, and other expenses incurred in carrying on the action. The pursuer of an action at law in Scot-

land, in addition to demanding payment of the sum claimed, or performance of the stated obligation, almost invariably asks the court to pronounce decree in his favour for the expense of the necessary proceedings taken or to be taken. The defender on his part usually demands the expense attending his defence; and the general rule is that the party who loses the action has decree pronounced against him for the judicial expenses of the cause as taxed, as well as for the subject-matter of the suit. Regularly the question of expenses ought to be determined in the decree which settles the point of law; for the expenses are not demandable in a new action. As it is often the case that a party succeeds in one part of his action and fails in another, or occasions unnecessary expense by the unskilful and negligent way in which he conducts part of it, even though he may be right on the whole, the adjustment of the amounts incurred by both parties often involves not only much nicety of calculation, but also questions of considerable legal difficulty. When the adjustment of expenses is a matter of calculation it is effected by the auditors of the court. When it involves questions of law, these, if not previously decided by the judge, must be carried back to him from the auditor. Should either party object to the amount awarded by the auditor, he must lodge with the clerk of process a short note of his objections, without argument. A copy of this must be furnished to the agent of the opposite party, and the court may direct the objections to be answered orally or in writing. Should the objector fail to make good his objections he will have to bear the expense of discussing it.

EXPERIMENTAL PHILOSOPHY is that which deduces the laws of nature, the properties of bodies, and their actions upon each other, from experiments and observations. In our inquiries into nature we are to be guided by those rules and maxims which are found genuine, and consonant to a just method of physical reasoning; and these rules are, by Sir Isaac Newton, reckoned four, viz. 1. More causes of natural things are not to be admitted than are true, and sufficient to explain the phenomena; for nature is simple, and does nothing in vain. 2. Therefore, of natural effects of the same kind, the same causes are to be assigned, as far as it can be done; as of respiration in man and beasts, of the descent of stones in Europe and America, of light in a culinary fire and in the sun, and of the reflection of light in the earth and the other planets. 3. The qualities of natural bodies, which cannot be increased or diminished, and agree to all bodies on which experiments can be made, are to be reckoned as the qualities of all bodies whatever; thus, because extension, divisibility, hardness, impenetrability, mobility, inertia, and gravity, are found in all bodies under our inspection, we may conclude that they belong to all bodies whatever, and are the original and universal properties of them. 4. In experimental philosophy, propositions collected from the phenomena by induction are to be deemed (notwithstanding contrary hypotheses) either exactly, or very nearly true, till other phenomena occur by which they may be rendered more accurate, or liable to exception. This ought to be done, lest arguments of induction should be destroyed by hypotheses, and logical series be superseded by conjectures.

EXPLORATOR, a contrivance invented by Beccaria, consisting of a wire, whose insulated ends, provided with knobs of tin, are fastened to a pole over the chimney, or to the top of a tree. From this wire another leads into a chamber, through a glass tube covered with sealing-wax, communicating in the chamber with an electrometer, by which the electricity of the air may be daily observed.

EXPLOSION. A sudden bursting, generally due to the rapid production of gaseous matter from solids or liquids. Thus the explosion of gunpowder is due to the production of a comparatively enormous volume of gas during the re-arrangement of its solid materials, so as to form a mixture of gases.

EXPONENT, in mathematics, is the index of a root or power. For instance, if a quantity is multiplied by itself any number of times, instead of repeating the factor so many times we place over it on the right a figure denoting how often the number or magnitude has been multiplied by itself, for example,

$$a^4 = aaaa = a, a, a, a.$$

$$9^2 = 9 \times 9 \times 9 = 729.$$

EX POST FACTO, in law, something done after and bearing upon something previously done; thus a law is said to be *ex post facto*, or retrospective, when it is enacted to punish an offence committed before the passing of the law—a violation of the plainest principles of justice.

EXPRESSED OILS, in chemistry, are those which are obtained from bodies only by pressing, to distinguish them from animal and essential oils, which last are, for the most part, obtained by distillation.

EXTENSION, in philosophy, one of the common and essential properties of matter, or that by which it possesses or takes up some part of universal space.

EXTENSION, a logical term, put into contrast with another term, comprehension. A general notion is extensive according to the extent of its application. Thus European is more extensive than Briton, man than European, animal than man, and organized being than animal. Matter and mind are the most extensive classes we can form. This property of extension is gained by dropping more and more of the peculiarities of the included individuals. In short, very extensive notions have a very narrow signification; it is the less extensive that have the most meaning. The meaning of man, or the number of attributes implied in this generic expression, is large. Everything that constitutes a human being is expressed by this term, which is said to be more comprehensive than animal or organized being.

EXTENT, in law, the peculiar remedy for recovering debts of record due to the crown (that is, debts decided to be due by a court of record). It is a writ of execution directed to the sheriff against the body, lands, and goods of a debtor, all of which may be taken at once, and in this it differs from a writ of execution at the suit of a subject. These writs are of two kinds: *extent in chief* and *extent in aid*; to both of which the sovereign was entitled by ancient prerogative, in order to obtain satisfaction of debts due to him, or assigned to the crown. The writ of extent in chief is a proceeding by the king for the recovery of his own debt, and in which he is the real plaintiff. The writ of extent in aid is also sued out at the instance, and for the benefit of, the crown against a debtor of a crown debtor, but in this proceeding the crown is the nominal plaintiff only. Under this writ the real and personal property of the debtor may be taken in execution, and sold within seven days if the debt is not cleared off.

In Scotland *extent* is a term applied to several valuations of the lands of the kingdom which were made in early times for purposes of taxation. The first of these, or at least the first that is well authenticated, was carried out in the reign of Alexander III., and was long known as the old extent, in contradistinction to a later one made in accordance with a statute of 1474. Church lands were not included in these valuations, but were assessed separately. Cromwell introduced a new mode of assessment which fixed the rates to be levied on each county. Most of the pub-

lic and parochial assessments were imposed according to these valuations up to the valuation acts of 1854 and 1857.

EXTRACT, a term used by chemists to denote all that can be dissolved out of a substance by a specified menstruum, such as water, alcohol, ether, &c. It has long been used in pharmacy to denote especially the soluble parts of vegetables, and according as water or alcohol was the solvent employed, the extracts were distinguished as *gummy* or *resinous*. Extracts vary in composition according to the plant treated, the solvent, the temperature, and other circumstances, and they generally contain several definite chemical compounds. Fourcroy, about the end of last century, after he had examined a number of extracts, thought that he had obtained a substance common to them all, to which he therefore gave the name of *extractive matter*. He supposed that it was at first soluble in water, but that by contact with the air it oxidized and became insoluble. Later experimenters showed the inaccuracy of these views, and the idea of such a principle has long since vanished from chemistry, but the name still remains, and is used in a vague way to denote in a vegetable analysis those portions of the vegetable extract which the analyst has not been able or willing to resolve into definite substances. In modern pharmacy the term extract is applied to two kinds of preparation from vegetables. One is got by digesting the plant or some portion of it in water or other solvent, and evaporating or distilling away the excess of solvent until the extracted matter is sufficiently inspissated. The other, which is only employed in a few cases, is got by bruising the plant in a mortar, separating the juice, warming it until the green colouring matter separates, and filtering it off. The juice is next heated until the albumen coagulates, and again filtered. The juice is now evaporated to a syrup, the green colouring matter added and well mixed, and the evaporation is thereafter continued until the required concentration is attained. In preparing extracts attention has to be chiefly given to the regulation of the heat. A direct fire can only be used at the beginning of the operation; afterwards the evaporation must be conducted by a steam or water bath, by a current of warm air, or spontaneously. In any case care must be taken that the extract does not burn or char. Extracts are generally prepared from plants containing active principles, and are employed in pills and other drugs.

EXTRACT OF MEAT (*extractum carnis*), is a soft, yellowish-brown, solid or very thick syrup, which is employed as a portable soup. It is now manufactured on the large scale by processes proposed by Liebig. Finely-chopped flesh is exhausted with water, the extract is heated, when, at 185° Fahr., albumen coagulates; afterwards the blood colouring matter also separates, and when these are removed and the clear liquid is evaporated at a low temperature, the extract is ready. This substance has a characteristic odour of roast-meat, has a strong taste, dissolves in water, and forms a not unpalatable soup. It contains no fibrin, gelatine, albumen, or fat, but creatine, inosic acid, and other organic bodies are present, and it is especially rich in potassic salts and in phosphoric acid. It has the invaluable property of not spoiling by keeping; and it has been strongly recommended for its nutritious qualities; but its price limits the sale, and there is, besides, a dislike to food from other sources than perfectly fresh and new meat. It is very useful, however, for travellers, for troops, and for all persons who have to carry supplies of food about with them, or to prepare it rapidly. It has been objected to, however, on the score that with the exception of the potassium salts and phosphoric it is

devoid of the essentially nutritive portion of the meat, and contains chiefly decomposition products, the value of which, as food, has not been very distinctly made out.

EXTRACTOR, in midwifery, an instrument, or forceps, for extricating children by the head.

EXTRADITION, the act by which a person accused of a crime is given up by the government in whose territories he has taken refuge, to the government of which he is a subject. In barbarous ages, when nations regarded each other as natural enemies, the crime committed in one was almost sure of impunity in another; and hence the origin of extradition may be ascribed to the progress of civilization. Experience showed that nothing could be more efficacious to repress crime than the certainty that when it had been committed there was not a spot of earth where the perpetrator could calculate on remaining unpunished, and international law, founding on this fact, adopted the principle of the extradition of criminals. In practice many nice questions have arisen on this subject, and governments and jurists have found it very difficult to fix the limits within which the power of extradition ought to be exercised. Conventions have been entered into by Britain with all or nearly all civilized states for the apprehension and extradition of persons charged with particular offences, especially those of the most heinous stamp, such as murder, robbery, embezzlement, arson, rape, piracy, &c. The Extradition Act of 1870 makes special provision that no criminal shall be surrendered for a political offence, and that the criminal shall not be tried for any but the extradition crime. The rule of refusing extradition of political offenders is maintained generally by civilized states.

EXTRADOS, the external outline or curve of an arch. See **ARCHITECTURE**.

EXTRAVASATION, in contusions and other accidents, occurs when blood-vessels are ruptured by the injury, and the blood finds its way into the neighbouring tissues. A good illustration may be found in an ordinary bruise, when the part becomes blue in consequence of the vessels having been ruptured, and blood having escaped into the tissues. Extravasation in the cranium is a most serious accident, as the pressure on the brain which is the result often produces death very rapidly. The term is, however, applied to the escape of any fluid into the tissues from the vessels, cavity, &c., containing it, such as extravasation of urine.

EXTREME UNCTION has been, since the twelfth century, one of the seven sacraments of the Roman Catholic Church: the Council of Trent specially declares it to be a sacrament (sess. xiv. canon 1 et seq.). It is performed in cases of very dangerous illness (after the viaticum) by anointing, in the form of a cross, the eyes, ears, nose, mouth, hands, and feet, the priest at each anointing repeating the prayer: Through this holy unction, and his most tender mercy, may the Lord pardon thee whatever sins thou hast committed by thy sight (or hearing, taste, &c.). It can only be administered by a bishop or priest, and is not applied in the case of mere infants or of persons devoid of reason. The oil used must be blessed by a bishop or by an authorized priest. A person who has received it may, if he recover, receive it on future occasions. The Roman Church derives its opinion of the efficacy of extreme unction from the custom of the apostles to anoint the sick with oil, accompanied with prayer (James v. 14, 15), but it is not regarded as necessary to salvation. Protestants deny the sacramental signification and power of this ceremony, because nothing is known of a formal establishment of it by Christ. In the Greek Church it is administered not only to sick persons, but

generally in diseases of all kinds, as tending to promote the restoration of health and the forgiveness of sins.

EXTREMITIES. This term is applied to the limbs, as distinguishing them from the other divisions of the animal, the head and trunk. The extremities are four in number, in man named upper and lower; in other animals anterior and posterior. Each extremity is divided into three parts: the upper into the upper arm, the fore-arm, and the hand; the lower into the thigh, the leg, and the foot. The upper is articulated to the shoulder-blade or scapula, the lower to the pelvis. In fishes the extremities are modified into the pectoral and ventral fins.

EXUVIÆ, among naturalists, denotes the cast-off parts or coverings of animals, as the skins of serpents, caterpillars, and other insects.

EY, a Scandinavian word, signifying island, and contained in several geographical words, as *Anglesey*, the island of the Angles.

EYCK, HUBERT VAN, a Flemish painter, considered as the founder of the Flemish school, was born after 1366 at Maaseyck. He was much distinguished by his paintings in distemper; and after the introduction of oil-painting, he practised in that with equal success. By some authorities he is credited with the general conception of the great picture of the Adoration of the Lamb (see following article), which is the first painting on an extensive scale in oil. He died in Ghent on Sept. 18, 1426.

EYCK, JAN VAN (also called *Jan van Brugge*, or *John of Bruges*, from Bruges, the place of his residence), was born at Maaseyck about 1381. His elder brother Hubert (see above) gave him his first instruction in the principles of the art, and his talents were so rapidly and vigorously developed that he soon surpassed his brother, and became the admiration of his own and succeeding times. The two brothers resided at Bruges, then much frequented by the noble and the wealthy on account of its flourishing commerce. About 1420, or soon after, they went to Ghent for a considerable time, to execute together a very large work which Jodocus Vydt, a Flemish noble, had engaged them to do. This is the celebrated Adoration of the Lamb for the cathedral of Ghent; a painting which, in its different parts, contains above three hundred figures, and is a masterpiece. It is painted on wood, with side panels which contain the portraits of the two artists and of their sister Margaret, likewise a painter. Of these panels six are now in the royal museum of Berlin. At the brilliant court of Philip the Good of Burgundy, by whom Jan was made painter to the court, the brothers had the best opportunities of improving their taste by spectacles of splendour of all kinds, dresses, jewels, furniture, arms, banquets, &c. Jan particularly availed himself of them in his works, in which such objects are represented with remarkable truth. Hubert did not live to see the painting above mentioned completed. Jan finished the work in 1432, and returned to Bruges, where he remained till his death, which took place on July 9, 1440. At Bruges he also executed several excellent pieces.

The reputation of this celebrated painter became very notable, even during his lifetime, by his great share in the introduction of oil-painting; the original invention of which has been incorrectly ascribed to him by many. Jan van Eyck was also of great service to the art by his improvements in linear and aerial perspective, and in painting upon glass. In regard to the first, we will only remark that it was a general custom, before this time, to have for the background of the picture a flat gold ground, from which the figure stood out without perspective, as may still be seen in numberless works of earlier date.

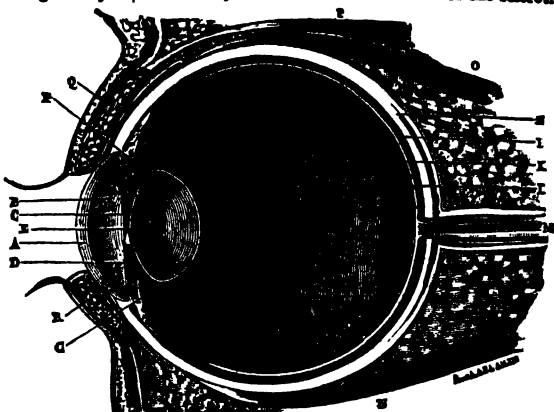
Van Eyck himself followed this practice in his earlier efforts, but, as he made further advances in his art, conceived the idea towards which there had been hitherto only some distant advances of giving a more natural grouping and perspective to his figures by a natural background. In this he succeeded so eminently, as many of his still remaining works prove, that he may be called in this respect the father of modern painting, since he gave the art a new turn and impulse, and laid the foundation of that high degree of improvement which it afterwards attained in the brightest era of the great masters who succeeded him in the Netherlands and in Italy. In the art of painting on glass he is considered as the author of the mode of painting with colours delicately blended and yet so firmly fixed that obliteration was impossible—an object before attained only by joining together (in mosaic) several small panes of different colours. The influence of Jan van Eyck, both as an artist and as an inventor, or rather improver of several branches of the art, was therefore very great. The school of which he was, in some measure, the founder, does not yield in celebrity to the best contemporary or succeeding artists, although it must be allowed to be often defective in the representation of the extremities of the human body—a fault occasioned by that excessive delicacy which prevented the study of naked forms, and of anatomy in general. On the other hand, the face, dresses, grouping, distribution of light and shade, are always superior, and the colour brilliant and splendid, in the works of this painter and most of his scholars. Many of his paintings are still preserved, either in churches and museums, or in private collections. Among his scholars are reckoned, besides the nearly contemporary Antonello of Messina, Roger van Brugge, Hans Hemling, and others, also the later masters, Albert Dürer, Luke of Leyden, Hans Holbein, Lucas Cranach, &c.

EYE. The visual apparatus consists of the globe of the eye, of the muscles which move it, and of its appendages, which are the eyelids and eyebrows, and the lachrymal apparatus.

The Globe of the Eye.—The globe of the eye may be described as a spheroid, to which the segment of a smaller sphere is applied in front. The walls of the globe of the eye are formed principally of two fibrous membranes; one white and opaque—the *sclerotic* from the Gr. *sklēros*, hard—which envelops two-thirds of the globe posteriorly; and the other transparent, and resembling a horny plate, whence its name *cornea* (Lat. *corneus*, horny). The sclerotic is one of the strongest fibrous membranes in the body; it is white on its external surface, and of a light brown colour internally; it is thicker at the posterior portion of the eye, where it opens to allow the passage of the optic nerve, than in front, where it is continuous with the cornea, with the fibres of which its fibres insensibly blend. The cornea is thicker than the sclerotic, and is composed of superposed layers perfectly transparent; it is convex in front, and concave behind, and appears to be circular, although its transverse diameter may be a little greater than the other. A mucous membrane, the *conjunctiva*, so named because it unites the eye to the lid, spreads over the anterior portion of the globe, and then folds back on itself and

lines the internal surface of the eyelids. The cornea, however, is covered only by the superficial layer of the conjunctiva, which becomes the corneal epithelium.

Choroid, &c.—The internal surface of the sclerotic



Vertical section of the Eye on the median line.

A, Cornea. B, Anterior chamber. C, Pupil. D, Iris. E, Crystalline lens. F, Zone of Zinn, forming the anterior wall of canal of Petit. G, Ciliary processes and circle. H, Sclerotic. I, Choroid. K, Retina. L, Vitreous body. M, Optic nerve. N, Right inferior muscle. O, Right superior muscle. P, Levator muscle of eyelid. Q, Lachrymal glands. R, Lachrymal canal.

is lined by a vascular membrane called the *choroid*, to which it is attached by a very fine cellular tissue. The choroid is composed of connective tissue, containing numerous large branched cells filled with dark pigment, and, in the inner stratum, a dense network of capillary vessels, while in the outer portion are the branches of the arteries and veins. The inner surface of the inner stratum, to which the old term *tunica Ruyshiana* applies, is covered with flat pigment cells. The choroid is pierced behind by an opening, which gives passage to the optic nerve; in front, near the circumference of the cornea, the choroid is thrown into a series of folds called the ciliary processes, the whole series forming a circle, as it were, in the interior of the eye, corresponding in position to the junction of the cornea and sclerotic. These processes, with other parts connected with them, form the ciliary body, and the circular disposition is indicated by the phrase ciliary ring. Connected with the ciliary body is the ciliary muscle, composed of bundles of involuntary muscle, which take origin from the junction of cornea and sclerotic, and spread backwards in a fan-shaped manner into the tissue of the choroid. Some of the fibres run in a circular fashion round the circumference of the iris, on a level with the ciliary processes. This muscle is the agent in effecting changes in the convexity of the lens upon which the power of the eye of focusing for seeing objects distinctly at different distances depends. The contraction of the muscle results in an increased convexity of the lens, necessary for distinct vision of a near object; and when the muscle is contracted to the utmost, and the lens has, therefore, attained its greatest degree of convexity, the limit of nearness at which an object is distinctly perceived is reached.

Iris and Pupil.—In front of the ciliary circle and the ciliary processes the choroid is continuous with the iris. This membrane forms a circular, vertically-disposed partition behind the cornea, and is pierced in the middle by a circular opening called the *pupil*. It represents exactly what is called a diaphragm in

optical instruments. It consists of tissue resembling that of the choroid, and contains involuntary muscular fibres, disposed circularly round the pupil, and also muscular fibres passing in a radiating direction from the choroidal attachment of the iris towards the pupil. The cells lining the anterior surface of the iris contain more or less pigment, and the membrane is thus coloured in different shades according to the individual, the variety of which has given to the membrane the name of iris, or the rainbow. Its posterior face is covered with a layer of pigment, which is called the *uvea*. It is well known that the pupil dilates in the dark, and contracts on the contrary in a bright light, only allowing that quantity of luminous rays to enter the eye which is necessary to vision. Certain substances when taken into the system act similarly on the iris; such are opium and the Calabar bean, which cause the pupil to contract; belladonna, on the contrary, dilates it. Changes in the diameter of the pupillary opening also result from certain affections of the eye and brain, and of the sympathetic nerves.

It has been remarked that the posterior surface of the iris, the ciliary processes, and the choroid are covered with a layer of pigment. In the eye this pigment plays the same part as the lamp-black in the interior of certain optical instruments, as the telescope and magic-lantern; it absorbs the luminous rays, and prevents them from being reflected, which would confuse the vision.

Retina.—The internal surface of the choroid, or rather the pigmentary layer which covers it, is lined by the *retina* or nervous tunic upon which the objects are depicted that we see. It appears to be formed by the expansion of the optic nerve, which enters the eye at its posterior part about one-tenth of an inch to the inner side of the axis of the eyeball, forming at its point of entrance an enlargement, which is called the *papilla of the optic nerve*. The retina lines the whole inner surface of the posterior cavity of the eyeball, and extends to the circumference of the ciliary processes, where it ends with a finely festooned margin, a cellular membrane running on to the ciliary processes, where it is lost. It is of an opaline pinkish colour, semi-transparent, and easily torn. Its centre, which corresponds to the antero-posterior axis of the eye, is to the outside of the papilla of the optic nerve, where there is the yellow spot (*macula lutea*) of Sommering, with a central depression (*fovea centralis*). The yellow spot seems to be the point in the eye where vision is most distinct. Microscopists describe the retina as being composed of five, or even eight layers, of which the internal one is vascular, and in contact with the vitreous, the external one, very important in a physiological point of view, is the *membrane of Jacob*. It is composed of cones and cylinders or rods, joined together like the stakes of a palisade, perpendicular to the plane of the membrane, and forming by their free extremities a mosaic, each microscopic division of which is about 0.001 of a line in diameter according to Robin, and 0.0008 of a line according to Helmholtz; and represents a section of a rod. We shall see what part these terminal points play in vision. In the central depression of the yellow spot rods are absent, cones are numerous, and the other layers of the retina become extremely thin. At the optic nerve entrance—the blind spot—here only the expansion of the nerve is found, and neither rods nor cones. Though the retina extends forwards to the ciliary processes, it is only in an attenuated form, none of the essential elements being found beyond the *ora serrata*, a finely indented border a little posterior to the edge of the ciliary processes, where the retina proper ends.

Vitreous Body.—The whole posterior portion of the cavity of the globe of the eye is occupied by a translucent substance called the *vitreous humour*. According to most anatomists, it is contained in an envelope called the *hyaloid membrane*. The vitreous humour and the hyaloid together constitute what is called the *vitreous body*, which coincides with the retina throughout its whole extent, and in front takes the form of the posterior surface of the crystalline lens. The hyaloid membrane becomes continuous with the ciliary zone of Zinn, or the suspensory ligament of the crystalline lens, which springs from the forepart of the lens near its circumference. Between this suspensory ligament, the margin of the lens, and the edge of the depression in the forepart of the vitreous humour, in which the lens rests, is a lymph space, the *canal of Petit*, which runs round the margin of the lens.

Crystalline Lens.—This is the name given to a double convex lens, more curved posteriorly than anteriorly, translucent, and placed vertically in the axis of the eye, so that the axis of the lens corresponds to the centre of the pupil. The lens is formed of superposed layers, which are less consistent outside than towards the centre; it is contained in a capsule, which applies itself closely to it. The greater or less convexity of the surfaces of the lens modifies the converging power of the lens, on which its function of bringing rays of light to a focus on the retina depends. The opacity of the lens, or of its capsule, forms the disease called *cataract*. The posterior surface of the iris is in direct contact, though not continuous, with the anterior surface of the lens. The interval which divides the iris from the cornea is the *anterior chamber*, which is filled with a fluid called the *aqueous humour*, less dense than the vitreous.

Muscles of the Eye.—The ocular globe is put in motion in the orbit by six muscles, grouped two by two, which raise or lower the eye, turn it inward or outward, or on its antero-posterior axis. In these movements the centre of the globe is immovable, and the eye moves around its transverse and vertical diameters. These three orders of independent of each other, and may be made singly, or in combination, in such a manner as to direct the pupil towards all points of the circumference of the orbit. The straight, superior, inferior, external, and internal muscles move it upward, downward, inward, and outward, and their successive action gives it a movement of circumduction. The two oblique muscles turn the eye on its antero-posterior axis, in such a manner as always to maintain the horizontal position of its transverse diameter, when the head or the body inclines to the right or the left. All these muscles take a direct or indirect part in every movement of the eye; if looking up or down, for example, the straight, superior, or inferior acts alone; the other muscles assure the movement, and confine it to the transverse axis. Such is the perfection of this mechanism, that the cornea is raised or lowered without the least lateral deviation, and the eye perceives by this succession of movements if the image of a line on the retina deviates 0.00003 of an inch from the vertical. The eyelids follow the movements of the globe when it is raised or lowered, obeying the action of the muscles of which they receive the aponeurotic prolongations. The movements of the two eyes are always symmetrical, and of the same kind; both are raised or lowered at once, directed to right or left, or around their axes; they can be turned inwards simultaneously to see an object very near at hand, or slightly outwards when they turn from such a point to one in the distance. Even when one eye is closed, the globe turns in the same direction as that of the open eye.

Eyelids.—Extending in front of the orbit there is an elliptical muscle, which is formed of concentric fascicles, and presents a transverse chink closed during contraction, and open in the shape of an almond when its fibres are relaxed. This is the *orbicular muscle of the eyelids*. Its internal surface, that is, the one next the eye, is covered by the conjunctiva, its external by the skin; its opening is circumscribed by the edge of the lids. The upper lid is larger than the lower, and is raised by a special muscle, the contraction of which alternates with that of the orbicularis muscle, which is its antagonist. The points where the eyelids are united by their commissures are called the *angles of the eye*. At the internal or greater angle of the eye the conjunctiva forms a fold, the *semilunar fold*, which is, in fact, a rudimentary representative of the third eyelid or nictitating membrane (*membrana nictitans*) of certain animals. Inside of this fold is the *lacrimal caruncle*, a small glandular body of a rose colour, which is covered by the conjunctiva. The edges of the lids have a fringe of silky hairs which protect the eye. The greater or less extent of the opening of the lids makes the eye appear larger or smaller; the conformation of the palpebral muscles and the tarsal cartilages gives to the eye an elongated and languishing form as in the East, or round and bold as among the western peoples.

The upper lid, which is attached to the arch of the orbit, is surmounted by the *eyebrow*, which is designed to protect the eye like a visor, and its movements play an important part in the expression of the face.

Lacrimal Apparatus.—This is composed of, firstly, the *lacrimal gland*, which lies in a depression of the orbital arch, and of little glands of the same nature, which form a granular layer in the substance of the upper lid; secondly, of the *lacrimal canals*, by which the tears are poured out upon the conjunctiva, a little above the border of the upper lid; thirdly, the *lacrimal ducts*, which are destined to receive the tears after they have bathed the eye, and of which the orifices or *lacrimal points* are seen near the internal commissure of the lids; fourthly, the *lacrimal sac*, in which the lacrimal ducts terminate, and which empties the tears into the *nasal canal*. The tears by running over the surface of the conjunctiva render it supple and facilitate the movements of the globe and eyelids by lessening the friction. The influence of moral or physical causes increases their secretion, and when the lacrimal ducts do not suffice to carry them off they run over the lids.

Vision.—Among the phenomena, which, taken together, constitute *sight*, some belong to the domain of physics (see the article OPTICS), and may be submitted to investigation, many may even be demonstrated by experiment; while others, on the contrary, are patent to the observation, but little known as to their cause or their mechanism, and await from the progress of science an explanation which physiology has as yet been unable to give. Even in those phenomena which at first seem purely physical, we must not forget that the refracting media of the eye are organized, and cannot be compared, except by approximation, to inorganic bodies, on the form and density of which physicists base their calculations. This is necessarily the cause of the differences in the theories promulgated in regard to vision; for although the eye may in some respects be considered as an optical instrument, we can never arrive at exact deductions by comparing devices analogous, or even similar in their construction, but different in their nature.

The retina renders the eye sensible of light, and we may therefore consider it as the essential organ of vision. The function of the other portions is to convey the luminous rays to its surface under conditions necessary to a nervous impression, which all

combine to insure, but which is accomplished in the retina alone. Other causes besides the contact of luminous waves may excite the retina; thus, the pressure of the finger on the eye, for example, and the disturbance resulting from a fall or a blow on the head, the action of electricity, and certain affections of the eye and brain, give rise, in the absence of natural or artificial light, to luminous images varying in form and intensity. Light produced under these conditions is called 'retinal light'; the image produced by pressure is known as a 'phosphenes'.

Like the optic and the other special nerves of the organs of sense, the retina has a special sensibility; it receives the impression from the light and transmits it by means of the optic nerve to the brain, but it is not itself sensitive to touch. No mechanical irritation causes it the slightest pain. In a normal condition the action of a too brilliant light, and in certain affections of the eye and brain the least ray will cause a painful sensation, but this pain must be referred either to the brain or to the nerves of the iris or of the ciliary circle, independent of the retina and the optic nerve. It is a remarkable fact that a limited portion of the retina, corresponding to the papilla of the optic nerve, is totally insensible to light; or has, at any rate, a very obtuse sensibility. This 'blind point', as it is called, is the only one on the internal surface of the eye which is not covered with pigment.

If we trace two figures on a horizontal line on a piece of paper placed vertically, and then shut the right eye, and fix the left on the right figure, at certain distances we can see both of them more or less distinctly; but, varying the distance of the paper from the eye, there is a point when we only see the figure upon which the eye is fixed; the other disappearing entirely, though it reappears when we change the position of the paper, or cease to look fixedly at one figure. The greater the distance between the two figures, the greater must be the distance of the paper from the eye, in order to render one of them invisible. The image of the invisible one is then projected on the blind point, and it reappears, when by the displacement of the paper the angle which its rays form with those from the other becomes greater or less.

In order that vision may be distinct, it is necessary that the rays should enter the eye in the direction of what is termed the visual axis, and the various movements of the organ tend unceasingly to place it in a position to fulfil this condition, and it is necessary, also, that the light should neither be too strong nor too weak, and that the rays shall traverse the central portion only of the crystalline lens, and not its borders. In order to obtain an analogous result in some of their instruments, opticians divide them by means of a partition pierced by a hole in the centre, which is termed a diaphragm. We find a similar arrangement in the eye, 'an intelligent diaphragm', to use the expression of M. Longue, that is, the iris, which dilates or contracts the pupil in such a manner as to measure the quantity of light necessary to vision, and which only allows those rays to pass which are directed towards the central portion of the crystalline lens. In the dark, or if we look at an object but slightly illuminated, the pupil dilates in order to admit the greatest possible number of rays which are refracted by the cornea; it is the same if we look at a distant object, the rays from which are less divergent; if this object becomes more luminous, or if we approach it, the pupil contracts in proportion.

The visual impressions are transmitted from the retina to the brain by means of the optic nerve, of which that membrane appears to be the expansion. The two optic nerves converge from the base of the

orbit toward the centre of the base of the skull, where there is an interlacement of their fibres in such a manner that a portion of the right nerve goes to the left side of the brain, and a part of the left nerve to the right side; this is called the *chiasma* or *commisura* of the optic nerves. Mechanical irritation of the nerve seems to develop luminous impressions as in the retina, but it causes no pain whatever.

Interior Vision.—The eye perceives not only external objects, but certain details of its internal organization. This portion of the visual phenomena is called *interior vision*, or *entoptics*. A bruise of the cornea through the lids, or a scar of foreign body on its surface, the vascular ramifications of the retina, and other causes of that nature, sometimes throw images on the retina of different forms, such as striae, spots, globules, dark or luminous circles which appear to move in the eye. Certain of these images are called flies, or motes (*muscu volitantes*), because they traverse the field of vision from one side to the other. Their appearance results from nothing abnormal, and they cannot be confounded, when there is no other disturbance of the visual functions, with the analogous signs which accompany and denote some diseases of the eye and brain. A lateral movement of the eye is sufficient to displace them or cause them to disappear.

Binocular Vision.—The difficulty which some persons have felt in reconciling the fact of an inverted image on the retina with the perception of an object in its true position is altogether fanciful, and arises from confused notions as to the nature of perception. The question as to how it is that we see objects single with two eyes rests upon a different footing, and is not to be altogether explained by habit and association. To each point in the retina of one eye there is a *corresponding point*, similarly situated in the other. An impression produced on one of these points is, in ordinary circumstances, undistinguishable from a similar impression produced on the other, and when both at once are similarly impressed the effect is simply more intense than if one were impressed alone; or to describe the same phenomena subjectively, we have only one field of view for our two eyes, and in any part of this field of view we see either one image brighter than we should see it by one eye alone or else we see two overlapping images. This latter phenomenon can be readily illustrated by holding up a finger between one's eyes and a wall and looking at the wall. We shall see as it were two transparent fingers projected on the wall. One of these transparent fingers is in fact seen by the right eye, and the other by the left, but our visual sensations do not directly inform us which of them is seen by the right eye and which by the left.

The principal advantage of having two eyes is in the estimation of distance and the perception of relief. In order to see a point as single by two eyes we must make its two images fall on corresponding points of the retinas; and this implies a greater or less convergence of the optic axes according as the object is nearer or more remote. We are thus furnished with a direct indication of the distance of the object from our eyes; and this indication is much more precise than that derived from the adjustment of their focal length of which we are now to speak.

Accommodation of the Eye to Distance.—The power possessed by the eye of seeing with equal distinctness the images of objects at very unequal distances was long the subject of investigation. One explanation was that in order to see objects at different distances, and especially very near to the eye, it modifies its form, or that of its media, and adapts itself to the distance in such a manner that the retina is always in the focus. According to some authors the length

of the axis of the eye varies, the retina approaching or receding from the crystalline lens. Others maintain that it is the lens which changes its place, or that the curves of the refracting media modify themselves in such a manner as always to make the apices of the luminous cones coincide with the immovable retinal surface. Helmholtz showed that the anterior surface of the crystalline lens increases in convexity in looking at objects near at hand, and flattens when looking at a distance, and that the pupil contributes also to the accommodation by contracting in looking at objects near at hand, and dilating to see at a great distance. The increased convexity of the lens is secured by the contraction of the ciliary muscle pulling forward the choroid and relieving the tension of the suspensory ligament, allowing the lens to bulge forward by its own elasticity.

Defective Vision.—The eye in its different parts is subject to various diseases and affections, some of them common to other parts of the body, others peculiar to itself. When the transparency of the cornea, the crystalline lens, or any of the humours, is destroyed, either partially or entirely, then will partial or total blindness follow, since no image can be formed upon the retina: but although all the humours and the cornea be perfectly transparent, and retain their proper form, which is likewise necessary to distinct vision, yet, from weakness or inactivity of the optic nerve, or injury of the central ganglia with which it is connected, weakness of sight or total blindness may ensue. To the first class belong those diseases called cataract, ophthalmia, &c., and to the second amaurosis, or gutta serena, &c. Although a person may not be under the influence of any of these diseases, yet defective vision may arise from the eyeball being so elongated that an image is formed before the rays reach the retina (a defect known as short sight or myopia), in which case distinct vision will be procured by interposing a concave lens between the eye and the object of such a curvature as shall cause the rays that pass through the crystalline lens to meet on the retina; or the eyeball may be short, so that the opposite condition arises, a defect which is corrected by convex lenses. See OPTICS.

The Eye in Comparative Physiology.—The eyes of different species of animals differ considerably in form and number. In animals that inhabit the lower regions of the atmosphere, including those that move along the surface of the earth, the eye is nearly spherical, the longest axis being from the cornea to the retina. In fishes the fore part of the eyeball is much flattened; in some the eyeball is like a hemisphere, the anterior part of which is flat, and in others the superior part is likewise flat; but in birds which occupy the higher regions of the atmosphere the deviation from the spherical form is in the contrary direction to that of fishes. The aqueous humour is more abundant in high-flying birds than in animals near the surface of the earth, and still more than in fish, in which last it is sometimes wanting. The crystalline lens is most globular in fishes, and flattest in birds. The less spherical the form of the eye is the stronger is the sclerotic. In the cuttle-fish the cornea is wanting, the iris is of a deep tawny brown colour; in the mammalia and in birds it varies from a bright yellow, red, or clear blue, according to the species. In fishes it is of a golden or silvery lustre, and in reptiles it is intermediate in metallic lustre. The pupil is round in man. In the cat kind it is formed by two elliptical segments, the opening running parallel to the direction of the nose. In ruminating animals, the horse, and the whale, the opening runs transversely, and in the dolphin it is of a heart form. The adaptation of peculiar structure in the eyes of

animals to their wants and situations forms a striking and interesting branch of physiology. The eyes of articulated animals, as the lobster, are compound; the nerve terminations being connected with a series of crystalline cones, closely packed together and so arranged that their free ends form part of a sphere, each free end being covered by a corneal lens developed from the cuticle. The mode in which the image was formed was a long time in being determined by physiologists.

EYE, in agriculture and gardening, signifies a little bud or shoot, inserted into a tree by way of graft.

EYE, a municipal and formerly a parl. borough, England, county Suffolk, in a fertile valley, 19 miles north of Ipswich. It consists of narrow and irregular streets, has a parish church with a handsome square tower 101 feet high (formerly a monastery church), a town-hall, &c. Eye received a charter from King John, and previous to 1885 sent a member to Parliament. Pop. (1891), 2064; (1901), 2004.

EYEBRIGHT (*Euphrasia officinalis*), a small plant belonging to the natural order Scrophulariaceæ, which is common in Britain and most parts of Europe, in North Asia, &c. It is annual, from 3 to 8 inches high, often much branched; the leaves ovate and dentate; the flowers axillary and almost sessile, white, streaked with purple, and with a yellow spot on the lip. It is a pretty little plant, and occurs so abundantly in some places as to give the ground a whitish hue when in flower. The whole plant has a bitter taste. Under the name of euphrasy it formerly enjoyed a great reputation in diseases of the eyes.

EYELET HOLES, round holes worked in a sail, to admit a small rope through, chiefly the robins (or rope-bands), and the points or reef-line.

EYELID. See EYE.

EYE OF A DOME, an aperture at the top of a dome, as that of the Pantheon at Rome, or of St. Paul's at London: it is usually covered with a lantern.

EYLAU, PREUSSISCH, a small town, about 28 miles distant from Königsberg, in Prussia Proper, with 3518 inhabitants, on the lake of Arsench, famous for a bloody battle fought between Napoleon and the allied Russians and Prussians, on the 7th and 8th of February, 1807. The chief battle was on the 8th, and lasted twelve hours, amid the thunder of 300 cannon. The carnage was increased by a fall of snow, under the blinding influence of which the column of Angereau marched too far to the left, and thus falling in their object, caused the battle to be much longer protracted. Angereau himself was wounded, and his corps dissolved and incorporated with the others, so much had it suffered. Ney and

Davout, who were despatched by the Emperor Napoleon to outflank the enemy, at last succeeded, and decided the battle; but the loss on both sides was terrible. Various statements of it have been given by the two parties, but the probability is that it amounted to about 18,000 on either side. Nine Russian generals were wounded; three French generals killed, and five wounded.

EZEKIEL (God shall strengthen), the third of the great prophets, a priest, and the son of Buzi. He was carried away when young (about 599 B.C.) into the Babylonian captivity. Here he received the gift of prophecy, while he was among other captives by the river Chebar. He was commanded by God in a vision to speak to the children of Israel, and to watch over his people. In another vision God revealed to him the sufferings which the Israelites were to undergo for their idolatry. God also revealed to him the end of the captivity, the return of his people, the restoration of the temple and city, and finally, the union of Judah and Israel under one government, and the return of their former prosperity. He was also miraculously informed of the siege of Jerusalem by the Chaldeans, and communicated the information to his fellow exiles. He prophesied against Egypt, against Tyre and Sidon, against the Idumeans and Ammonites. His prophecies are divided into forty chapters; they are obscure, but full of poetic fire. Their genuineness and just title to a place in the sacred canon cannot be disputed.

EZRA, a celebrated Jewish scribe and priest, lineally descended from Aaron, and according to Josephus, high-priest of the Jews who were left in Babylon. Under his guidance the second expedition of the Jews set out from Babylon to Palestine under the reign of Artaxerxes I., about 458 B.C. The important services rendered by Ezra to his countrymen on that occasion, and also in arranging, and in some measure, it is believed, settling the canon of Scripture, are specially acknowledged by the Jews, and he has even been regarded as the second founder of the nation. Josephus states that he died in Jerusalem, and was buried there with great pomp; others assert that he returned to Babylon, and died there at the age of 120 years. Ezra is said to have introduced the present square Hebrew characters, and to be the author, not only of the book which bears his name, but also of the Chronicles, Nehemiah, and Esther. The book of Ezra contains an account of the favours bestowed upon the Jews by the Persian monarchs, the rebuilding of the temple, Ezra's mission to Jerusalem, and the various regulations and forms introduced by him. It is written partly in Hebrew and partly in Chaldee, a fact which has led some to conclude that it is the work of different hands.

F.

F is the sixth letter of the English and other alphabets of Western Europe, as it was also in the Latin alphabet, from which they are derived. The Latin alphabet was obtained from the Greeks of Southern Italy and Sicily, and the Latin F is the so-called *Follic digamma*, which, as a written character at least, is not found in the existing remains of Greek literature. In classical Greek the letter ϕ had the power of F, and accordingly it was used in transliterating Latin words into Greek, thus the Latin *Fa* was

became in Greek $\phi\acute{\alpha}\sigma\iota\varsigma$. Conversely in Italian, Spanish, and Portuguese, *f* is always used in words derived from the Greek, where we use *ph*. The letter can be traced back to the Phœnician alphabet, which, as is well known, was the first introduced into Europe. F represents the sound produced by bringing the upper teeth against the lower lip, and then breathing with a slight hissing sound. It therefore belongs to the letters known as aspirates, and is called a labial aspirate. In Sanskrit there is no sound corresponding

to that represented by *F*, but in the other Indo-European or Aryan languages it occurs. In English roots in *F* that are also common to Sanskrit, Latin, and Greek, we find that the *f* represents *p* in these latter languages; thus *foot* corresponds to Sanskrit *pada*, Greek *pous*, *podas*, Latin *pes*, *pedis*; so *father* corresponds to Sanskrit *pitrī*, Greek *patēr*, Latin *pater*; *off*, Sanskrit *apa*, Greek *apo*; *for*, Sanskrit *para*, Greek *para*, Latin *per*; *flood*, Sanskrit *plu*, Greek *pleo*, Latin *pluo*, &c. The Latin *f* passes frequently into *h* in the Romance languages, thus *ferum*, *filius*, *facere*, *formosus*, became in Spanish *hierro*, *hijo*, *hacer*, *hermoso* (all with *h* mute); *foris*, French *hors*; *fabulari*, *fanum*, *fadus*, Walachian *hebleve* (Spanish *hablar*), *han*, *hed*, &c. The Romans for some time used *F* inverted, thus, *gi*, for *V* consonant, as *TERMINA_{IT}* for *TERMINAVIT*, or *DI_{GI}* for *DIVI*. Some have supposed that this was one of the three letters invented by Claudius, but many inscriptions, belonging to periods much anterior to the time of Claudius, exhibit this singular use of this letter. *F* signified, as a number, among the Romans, 40; with a dash over it, 40,000. *F*, on engravings or pictures, stands for *fecit* or *faciebat* (made). In jurisprudence, *f* signifies the *pandects*. This abbreviation originated in the early period of the art of printing, when no Greek characters had yet been cast, and *f* was used for *ϕ*, the first letter of *ϕωδεραι*. On medals, monuments, &c., *F* stands for *Fabius*, *Furius*, &c., *Filius*, *Felix*, *Favustus*, &c. *FF*, on Roman coins, means *fando*, *ferendo*. On French coins, *F* means the *mint of Angers*; on Prussian coins, of *Magdeburg*; on Austrian, of *Halle in the Tyrol*. *F*, with merchants, signifies *folio* (page). *F* often stands on documents for *fat* (let it be done, granted, &c.) *Fl* is the abbreviation for *Morin*, or guildier; *fr*, for *franc*; *ff*, in German, for *folgende*, like *seq.* in English.

F, the fourth note in the natural diatonic scale of *C*, standing in proportion to the tonic as 4 to 3. *F* major, as a key, has one flat at its signature. *F* minor, the relative minor of *A* flat major, has four flats. The *F* or *Fa* clef is another name for the bass clef. *F*, in music, over a line, means *forte* (loud); *ff*, *molto forte* (very loud).

FA, the name given by Guido to the fourth note of the natural diatonic scale of *C*.

FABBRONI, GIOVANNI, an eminent Italian philosopher, who distinguished himself by his attention to political economy, agriculture, and physical science. He was born at Florence in 1752, and died in 1822. He was a leading member in numerous learned and scientific societies, and left behind him a considerable number of valuable memoirs and treatises on matters relating to chemistry, agriculture, physiology, &c., of which the best known are *Provvedimenti Annonari*; his *Discourses on National Prosperity*, on the *Equilibrium of Commerce*, and the *Establishment of Custom-houses*; on the *Effects of the Free Traffic in Raw Material*; on *Rewards for the Encouragement of Trade*; on the *Chemical Action of Metals*; on the *Value and Reciprocal Proportion of Coins*; on the *Scales and Steelyards of the Chinese*; on the *Palaces of Spain*; and on the *Ancient Hebrew People*.

FABER, REV. GEORGE STANLEY, an able and popular theological writer, born in 1773, was the eldest son of the Rev. Thomas Faber, rector of Calverley in Yorkshire. Before his sixteenth year he entered University College, Oxford, and before his twenty-first was a fellow and tutor of Lincoln College. Having been Bampton lecturer in 1801, he shortly after published his lectures under the title of *Home Missions*, of which a second edition augmented was published in 1818. From the first he had adopted what is called evangelical views, and he soon began

to give them efficient aid by his pen, particularly by a work on baptismal regeneration, entitled *The Doctrine of Regeneration in the Case of Infant Baptism*. In 1803, when his marriage made it necessary to resign his fellowship, he became curate to his father. He was afterwards vicar successively of Stockton-upon-Tees, Redmanshall, and Longnewton, the last of which appointments he had held for twenty-one years, when he resigned it to become master of Sherburn Hospital. The year before he had obtained a prebend in Salisbury Cathedral. His principal writings, in addition to those already mentioned, are *A Dissertation on the Prophecies*, the most popular of all his works, having in 1818, only four years from its first appearance, reached a fifth edition; and the *Difficulties of Romanism*, of which a third edition appeared in 1858. Mr. Faber died on 27th January, 1854.

FABII, an ancient and renowned family of Rome. One of the legends in ancient Roman history is, that all of them who were able to bear arms, 306 in number, with 4000 clients, established themselves in a post on the river Cremera, not far from Rome, to protect the Roman territory against the incursions of the Veientes. Being drawn into an ambush, they were killed to a man (B.C. 477), the sole representative of the family being a boy who happened to be left in Rome, and who thus became the second founder of the Fabian gens. Among the most celebrated members of the gens in after-times was Fabius Maximus Cunctator, the well-known opponent of Hannibal in the second Punic war. See **HANNIBAL**.

FABLE, in literature, a term applied originally to every imaginative tale, but confined in modern use to short stories, either in prose or verse, which are meant to inculcate a moral lesson in a pleasant garb. The *fable*, as a particular kind of poetry, sometimes called *apologue*, is justly considered a species of didactic composition, and is a kind of *allegory*. It may be described as a method of inculcating practical rules of prudence or wisdom by imaginary representations drawn from the physical or external world. It consists properly of two parts—the symbolical representation, and the application, or the instruction intended to be deduced from it, which latter is called the *moral* of the tale, and must be apparent in the fable itself in order to render it poetical. On account of its aim it lies upon the borders of poetry and prose, is rarely in true poetic spirit, and pleases independently of its object. The satisfaction which we derive from fables does not lie wholly in the pleasure that we receive from the symbolical representation, but lies deeper—in the feeling that the order of nature is the same in the spiritual and the material worlds.

Herder divides fables into—1. *Theoretic*, intended to form the understanding; thus a phenomenon of nature, as illustrative of the laws of the universe, is used to exercise the understanding. 2. *Moral*, which contain rules for the regulation of the will. We do not learn morality from the brutes, but view the great family of nature, and observe that she has connected the happiness of all living creatures with the unchangeable, eternal law of effort, and take example from the observance of this law by the lower orders of creation. 3. *Fables of fate or destiny*. It cannot always be made evident how one thing follows as a necessary consequence from another; here then comes in play that connection of events which we call *fate*, or *chance*, and which shows that things follow, at least after, if not from one another, by an order from above. Thus the eagle carries with her plunder a coal from the altar, which sets fire to her nest, and thus her unfledged brood becomes the

prey of animals which she has already robbed of their young. The plan of the fables is regulated by this threefold division of the subject and character. In general it must possess unity, that the whole tenor of it may be easily seen; and dignity, since the subject has a certain degree of importance. But this does not exclude gaiety nor satire.

The oldest fables are supposed to be the oriental; among these the Indian fables of Pilpay or Bidpai, and the fables of the Arabian Lokman, are celebrated. (See PILPAY and LOKMAN.) Æsop is well known among the Greeks, and was imitated by Phædrus among the Latin writers. Bodmer has published German fables of the time of the Minnesingers. The first known German fabulist is Stricker, who belongs to the first half of the thirteenth century, but the famous medieval fable of Reincke Fuchs has a much more remote origin. Boner, who lived at the close of the fourteenth century, shows in his Edelstein the true spirit of fable. Burkard Waldis may be mentioned in the sixteenth century. The most successful of German fable-writers is undoubtedly Lessing. In the seventeenth century Gay among the English, and La Fontaine among the French, were distinguished. The writer last named made fable the vehicle of wit, and carried it to its highest stage of perfection. Among the most interesting modern productions in this department of literature the Fables of the Russian, Ivan Kriloff, deserve special mention.

FABLIAUX (from the Latin *fabulari*, or *fabulari*, to speak or narrate), in French literature, the short metrical tales of the Trouvères, or early poets of the Langue d'Oïl, or dialect of the northern provinces, composed for the most part in the twelfth and thirteenth centuries. These productions were intended merely for recitation, not for singing, and had as their principal subjects the current gossip and news of the day. A reciter of fabliaux was called *fablieor* (pl. *fablière*), in contradistinction to the *chan-teur* or singer proper. The province of the *fablieor* included also the *Romans d'aventure*, in short, rhyming couplets, the *Contes* a shorter class of narratives, and the *Dits* or sayings. As the fabliaux were distinguished from these classes of poems by the character of their subject-matter, which was drawn from the real world and every-day life; so their treatment of it was more anecdotic and epigrammatic, and marked with strokes of malicious wit. To the epic poems and their ideal life the fabliaux stood forward in direct opposition, their arms being irony and parody. The character of the French people here distinctly manifested itself, and that opposition of the real to the ideal, of the reason to the fancy, of the civil to the ecclesiastical and chivalric, which marks French literature from the time of Francis I. The fabliaux lashed not only the clergy and nobility in their degeneracy, but even mocked the religious equivocal spirit, and the religious and knightly doctrines and ceremonies. Thus Rutebeuf, one of the most productive fablieors of the time of Louis IX. and Philip IV., was in every respect a genuine child of Paris, and may be looked upon as a prototype of Villon, Lafontaine, or Voltaire. The best collections of Fabliaux and Contes are those of Barbazeau (enlarged by Méon, four vols. Paris, 1808), and Montaignon and Raynaud, *Recueil des Fabliaux des xiii^e et xiv^e siècles* (six vols. Paris, 1872-88).

FABRE D'ÉGLANTINE, PHILIPPE FRANÇOIS NASSAIRE, a French dramatic writer, was born at Carcassonne in 1755. As early as his sixteenth year he wrote a poem (*L'Étude de la Nature*) for the prize offered by the French Academy, 1771. Having afterwards gained the prize of the Églantine in the Floral games at Toulouse, he assumed the name of that flower as a surname. He now wrote several

theatrical pieces, of which however only two, *L'Intrigue épistolaire* and the *Philinte de Molière*, were successful. The latter is still considered one of the best character-pieces of the modern French stage. He engaged with ardour in the revolution, acting with Danton, Lacroix, and Camille Desmoulins. Having been chosen deputy from Paris to the national convention, he at first supported moderate principles, but afterwards voted for the death of Louis XVI. without appeal, and was chosen a member of the committee of public safety. He afterwards became suspected by the Jacobins, was accused of falsifying a decree of the national convention relative to the liquidation of the old French East India Company, and being condemned to death was executed along with his colleague Danton April 5, 1794.

FABRETTI, RAFFAELE, an Italian antiquarian, was born in 1818 at Urbino, in the Papal dominions. Having early gone to Rome, where his elder brother Stephen, a respectable lawyer, was residing, he conceived a fondness for those studies in which he afterwards gained so much fame. He was sent to Spain by the cardinal Lorenzo Imperiali with an important public commission; after the successful termination of which he was made Papal treasurer by Alexander VII., and, soon after, auditor of the Papal legation at the court of Madrid. He was subsequently counsellor of appeals in the Capitoline court of justice, legal counsellor to Cardinal Cesi, legate of Urbino, and finally superintendent of the archives in the castle of St. Angelo, which office he held till his death in 1700. The latter part of his life was spent at Rome in antiquarian pursuits. Among his writings may be mentioned *De Aquæductibus veteris Romæ*, *De Columna Trajani*, and *Inscriptionum Antiquarum Explicatio*, in the last of which much light is thrown on the discoveries made by himself in the Catacombs.

FABRIANO, a city of Italy, 36 miles west-south-west of Ancona, and in the province of that name, at the foot of the Apennines, with a cathedral, some fine churches, several convents, and manufactures of felt-cloth, paper, parchment, and glue. Pop. 5699.

FABRICIUS, CAIUS (with the cognomen *LUSCIVS*), a pattern of ancient Roman virtue in his fearlessness, integrity, moderation, and contempt of riches. After having conquered the Samnites and Lucanians, and enriched his country with the spoils, of which he alone took nothing, he was sent on an embassy to Pyrrhus, king of Epirus, to obtain the ransom of some Roman prisoners. Pyrrhus wished to bribe Fabricius, with whose poverty he was acquainted, by large presents. But the honest Roman refused them. As little was he moved by the sight of an elephant which Pyrrhus, to try his firmness, had concealed behind a curtain, and suddenly exhibited to him in a threatening posture. Pyrrhus dismissed him with admiration, and permitted the prisoners to go to Rome to celebrate the approaching Saturnalia, on a promise that they would return after the festival, which they faithfully kept. The king was so charmed with the conduct of Fabricius that he offered him the highest post in his kingdom if he would attach himself to him after the conclusion of peace; but he independently refused the offer. When consul (279 B.C.) Fabricius delivered up to Pyrrhus his treacherous physician who had offered to poison his royal master for a sum of money. In gratitude for the service the king released the Roman prisoners without ransom. In the year 279 B.C. the battle at Asculum was fought, in which Pyrrhus was victorious, but lost the best part of his army. 275 B.C. Fabricius was chosen censor with Æmilius Papus, and removed Cornelius Rufinus from the senate because he had 10 lbs. of silver plate. Fabricius

was so poor at his death that his daughter received a marriage portion from the public treasury. To honour him even in death, the law of the twelve tables, which prohibited all burials in the city, was suspended in his case.

FABRICIUS, GIBOLANO, an Italian physician, born at Aquapendente in 1587. He studied at Padua under the celebrated Fallopius, whom he afterwards succeeded in the anatomical chair, and had Harvey, the discoverer of the circulation of the blood, for a pupil. Our distinguished countryman acknowledges that the discovery of the valves in the veins made by his master put him on the way of his discovery. During the lifetime of Fabricius his merit was fully recognized by the public and the state. He retired from public life loaded with honours and wealth, and died at the age of eighty-two. His works, which were considered as of the highest authority, were collected and published by Bohnus (Leipzig, 1687).

FABRICIUS, JOHANN ALBRECHT, a celebrated German scholar, was versed in almost every department of human knowledge, particularly in philology and ancient literature, and understood the art of using these stores of erudition to the greatest advantage. He was born at Leipzig in 1668, where he studied philosophy, medicine, and theology, and was afterwards made professor of rhetoric and moral philosophy in the gymnasium at Hamburg. In 1719 the landgrave of Hesse-Darmstadt offered him the first professorship of theology at Giessen, and the superintendency of the Lutheran parishes in his domains; but the authorities of Hamburg retained him in that city by enlarging his income, and he continued to reside there till his death in 1736. His work on Greek literature is a model of profound, various, and comprehensive erudition. This is his *Bibliotheca Græca*, improved by Harless. No less useful are his *Bibliotheca Latina*, *Bibliotheca mediæ et infimæ ætatis*, *Bibliotheca Ecclesiastica*, and *Bibliotheca Antiquaria*. Besides these his edition of Sextus Empiricus, and his remarks on Dion Cassius, evince the depth and extent of his learning.

FABRICIUS, JOHANN CHRISTIAN, one of the most celebrated entomologists of the eighteenth century, was born at Tundern in the duchy of Schleswig, 1748. After he had finished his academic course at Copenhagen, at twenty years of age, he pursued his studies at Leyden, Edinburgh, and Freiburg, in Saxony, and under Linnæus at Upsal. Few scholars of that great man profited more by his instructions. His works upon entomology show, evidently, the principles, the method, and even the forms of expression, peculiar to Linnæus, applied to the development of a new, happy, and fruitful train of ideas. Nor did he attempt to conceal how much he owed his master: he has left to posterity perhaps the most important part of the existing materials for a complete biography of that great student of nature. From his intercourse with him he derived his first notions of his system of arranging insects according to the organs of the mouth; and he endeavoured to persuade Linnæus to make use of it in the new edition of his *Systema Nature*, which he, however, declined doing. Fabricius obtained soon after the situation of professor of natural history in the University of Kiel, and from this time devoted himself entirely to his favourite study. In 1775 appeared his *System of Entomology*, which gave to this science an entirely new form. Two years afterwards he developed in a second work the characters of the classes and orders, and demonstrated in the *prolegomena* the advantages of his method. In 1778 he published his *Philosophia Entomologica*, written upon the plan of the well-known *Philosophia Botanica* of Lin-

næus. From this time till his death, during a period of thirty years, he was constantly occupied in extending his system, and in publishing it, under various forms, in works of different titles. He was appointed counsellor to the King of Denmark, and professor of political and rural economy. He died March 8, 1808, in consequence, it is said, of grief at the bombardment of Copenhagen by the British, and the misfortunes of his country.

FABRONI, ANGELO, a celebrated Italian biographer, born at Marradi, in Tuscany, 1732. He was educated at Rome, in the College of Bandinelli, where he studied logic, physics, metaphysics, and geometry, and wrote the life of Clement XII. Being supported and encouraged in his studies he conceived the idea of writing the lives of the Italian literati of the seventeenth and eighteenth centuries, and devoted himself with the most active zeal to the execution of this work, the first volume of which appeared in 1766. He died in 1803. The best edition of his *Vite Italorum Doctrina excellentium qui Seculo XVII et XVIII floruerunt* is the Pisa edition of 1778-99, eighteen vols. The nineteenth and twentieth volumes were added after his death, one of them containing his own life up to 1800. This work, containing 167 biographies, is one of the best of its kind.

FABRONI, GIOVANNI. See **FABRONI**.

FAÇADE is the outside or external aspect of an edifice. As in most edifices only one side is conspicuous, viz. that which faces the street and usually contains the principal entrance, this has been denominated, *par eminence*, the *façade*. As a work of architecture it must form a whole, of which all the parts are properly related and symmetrically arranged, and correspondent to the character or style of the edifice. See **ARCHITECTURE**.

FACCIOLATI, JACOPO, an Italian philologist, was born at Torgia, near Padua, in 1682. The talent discovered by him when a boy caused the Cardinal Barbarigo to place him in the seminary at Padua. Here he became, in a few years, doctor in theology, professor of this science as well as of philosophy, and finally, prefect of the seminary and director-general of studies. He devoted the greatest attention to reviving the study of ancient literature; and, for the promotion of this object, he undertook a new edition of a dictionary in seven languages, which was called the *Calepin*, from the name of its author, the monk Ambrosius Calepinus. His pupil, Forcellini, assisted him in the undertaking, and the work was completed in two vols. folio, between the years 1716 and 1719. He now, in company with his illustrious disciple, conceived the idea of a Latin lexicon, in which every word, with all its significations, should be contained and illustrated by examples from the classical writers, after the manner of the dictionary of the Cruscan Academy. This immense undertaking occupied them both for nearly forty years. Facciolati directed the work, which was almost entirely executed by Forcellini. With the same assistant and some others he superintended a new edition of the lexicon of Schrevelius and the *Lexicon Clovonianum* of Nizoli. He left many Latin discourses which are characterized by their Ciceronian elegance of style, but differ from their model by a great brevity. He also completed the *History of the University of Padua*, which had been brought down to 1740 by Pappadopoli. He died 1769.

FACE, the front part of the head, the seat of most of the senses, is composed of the forehead, the eyelids and eyebrows, the eyes, the nose, the cheeks, the mouth, the lips, the jaws, the teeth. Beneath the skin, which, in the face, is more delicate, more soft, more sensitive and clear than in other parts, are numerous muscles, by which the motions of the skin

are produced. They are enveloped in fat. There are also a greater number of vessels and nerves in the face than in any other external part. Underneath these is the bony basis, which, exclusive of thirty-two teeth (these not being in the strict sense bones), is composed of fourteen bones, called, in anatomy, the *bones of the face*. The anterior part of the skull (or *frontis*) also forms an important feature of the face. Of all these bones the lower jaw only is movable, being articulated with the basis of the skull. The other bones are firmly joined together and incapable of motion. The character of each individual is always marked, in some of its traits at least, by the conformation of the countenance, and this has given rise to the art of physiognomy, which has always existed. But though physiognomy has always to some extent more or less consciously guided the actions of men in their intercourse with each other, and has dictated the descriptions of poets, who assign to their heroes features in keeping with their characters, neither it nor phrenology can be recognized as resting on a scientific basis. The expression of the face depends on the configuration of its skeleton, on the amount of fat in which the muscles are embedded, and on the strength of the muscles themselves. But the natural expression may be modified by disease of remote, even of unsuspected organs, and by habitual concentration on particular actions, while the influence of education and religion may render the character utterly dissimilar to that suggested by the expression. (See PHRENOLOGY and PHYSIOGNOMY.) In brutes the jaws project much more than in men, and form the prominent feature of the face, while the forehead recedes. This conformation gave rise to the theory of the *facial angle*, brought forward by Peter Camper, who seeks to establish a connection between the magnitude of this angle and the intelligence of different animals and men, maintaining that it is always greater as the intellectual powers are greater. Suppose a straight line drawn at the base of the skull, from the great occipital cavity across the external orifice of the ear to the bottom of the nose. If we draw another straight line from the bottom of the nose, or from the roots of the upper incisors, to the forehead, then both lines will form an angle which will be more acute the less the shape of the face, in brutes, resembles that of men. In apes this angle is only from 45° to 60°; in the skull of a negro, about 70°; in a European, from 75° to 85°. In many of the Grecian works of statuary this angle amounts to 90°; in statues of Jupiter and Apollo it is 100°. The measurement now adopted by anatomists is more precise. From the anterior end of the sphenoid bone two lines are drawn, one to the foramen magnum, the other to the most anterior point of the upper jaw. The angle included between these, which varies in man from 90° to 120°, is more capable of comparison among vertebrate animals than the angle of Camper.

FACHINGEN-WATER (German, *Fachinger Wasser*), a mineral water, from a spring near the village of Fachingen, in Nassau, Germany. The village is not a watering-place, little of the water being drunk on the spot. About 400,000 bottles of it are exported yearly. The water resembles Selters, and contains in 16 oz. 32·9 cubic inches of carbonic acid gas, and 38·39 grains of solid matter, consisting chiefly of bicarbonate of soda, with some lime and magnesia and chloride of sodium, and much smaller quantities of iron, strontia, lithia, phosphatic acid, and fluorine. It belongs to the class of acidulo-alkaline waters, and is used in diseases of the kidneys and bladder.

FACIAL ANGLE. See **FACE**.

FACSIMILE (from the Latin root *fac*, make, and *simile*, similar), an imitation of an original in all

its traits and peculiarities; a copy as accurate as possible. Thus facsimiles of old manuscripts, or of the handwriting of famous men, or of interesting documents, are made in engraving or lithography. The making of facsimiles has been much facilitated by photography. The object of facsimiles is various; in the case of old manuscripts they are intended to show the age of the MS. by the nature of the characters. See **MANUSCRIPT**.

FACTOR, in arithmetic, is any number which is multiplied by another: thus 7 and 4 are the factors of 28. They are divided into simple and composite. A simple factor is one which is divisible only by itself.

FACTOR, in commerce, an agent employed to do business for another in buying or selling, or in the charge of property. A factor seems to differ from a broker in holding a wider and more discretionary commission from his employer; but the difference depends upon the usage of the particular trade, or upon the special instructions constituting the agency, and no exact line of demarcation can be drawn between them. The term factor has in common usage generally given place to the terms agent and broker, the former applied in the more general, the latter in the more restricted sense. It is still retained in some special cases, as in that of house-factors and factors on landed property in Scotland, who have charge of the letting and general management of house property, farms, &c.; called in England estate agents. The use of the term factor seems at one time to have been specially applied to the foreign agents intrusted with the sale on commission of goods on consignment, now called consignees or commission agents. The distinctions between a factor in this sense and a broker laid down in law books do not hold good in practice, for the reason that the theoretical boundaries between the two kinds of agency are not observed. It is said that a factor is intrusted with the possession of goods; is entitled to sell them as if they were his own, and holds a lien on them for outlay, &c. A foreign agent is at liberty to use his discretion in selling goods if he has no special instructions, but he is not at liberty to violate his instructions; a broker, on the other hand, has frequently goods consigned to him for sale, and even makes advances on them, when he certainly holds a lien on them for his outlay. A broker is bound to hand over any cash he receives at once to his principal, an agent is bound to follow his instructions in remitting it. Again, a foreign agent does not usually give up the names of his customers to his principal as the broker does; and he usually guarantees their solvency, for which he receives a special commission, and which the broker does not do, but if the agent becomes himself insolvent the consigner can collect the outstanding debts on his own account, or assert a preferable claim to them if collected by the trustee of the insolvent, just as if they were sold by a broker. The term factor may, indeed, be regarded as merely synonymous with agent, while functions implied in it, and those of brokerage, are frequently combined in the same person and in the same transaction. See **AGENT** and **BROKER**.

FACTORY (from *factor*) appears originally to have been used for a depot of goods in a foreign market under the charge of a factor; it now more commonly signifies a place in which the various processes of a particular manufacture are carried on simultaneously. The rapid growth of factories in this sense is a comparatively recent development of industry resulting from the free use of machinery, and the consequent subdivision of labour, the advantages of which are so well illustrated by Adam Smith in the first chapter of his *Political Eco-*

mony. The factory system, like most great organizations, has its drawbacks as well as its advantages. By increasing production it tends to diminish the hours of labour, and by bringing workmen together it affords them opportunities of higher cultivation, but this latter is frequently counterbalanced by the smaller amount of independent intelligence called forth in the individual worker through the monotony of the minutely subdivided operations of production. Perhaps the worst symptom of the ultimate tendency of the factory system has been its constantly increasing demand on the labour of women and children, thus interfering with the economy of domestic life, and adding a formidable complication to the difficulties of education. Increased productiveness does not necessarily imply increased facility in procuring the means of subsistence. Wherever there is increased productiveness, increased population is on the march to overtake it. See next article.

FACTORY ACTS. Considering that women and children employed in manufacture were not qualified fully to protect themselves against the strain of competition, the British legislature has from motives of humanity passed a series of acts to regulate the conditions of their labour in factories and workshops. The immediate occasion of the first act passed was the outbreak of an epidemic disease which committed great havoc among the younger persons employed in factories in the district round Manchester at the end of the eighteenth century. The conditions under which children in particular worked in factories at that time were almost the worst possible. They were to a large extent paupers from the agricultural districts, who were transferred to the manufacturing districts that they might earn the means of support for themselves. Their hours of working were long, the accommodation provided for them miserable, and the mills and factories in which they laboured overcrowded and ill-ventilated. An act was therefore passed in 1802 for the preservation of the health and morals of apprentices and others employed in cotton and other mills, and cotton and other factories'. In this act provision was made for improving the sanitary condition of these places by making certain regulations regarding their cleansing and ventilation, likewise for the improvement of the clothing of the apprentices employed, for their instruction, and also for limiting the hours of labour. These last were restricted to twelve daily, and it was enacted that work was to cease altogether from nine at night to six in the morning. The act was made to apply to all mills employing three or more apprentices or twenty or more other persons. In 1819 another followed for the regulation of cotton-mills alone, and in this act a limit of age (nine years) was fixed below which no child was to be employed in factory work. Between that age and sixteen the daily working hours were limited to twelve, and in the course of the working day an hour and a half had to be allowed for meals. The Saturday half-holiday was introduced by Sir John Cam Hobhouse's act in 1825. A subsequent one, 1 and 2 William IV. cap. xxxix. (1831), after repealing four previous acts on the same subject, provides that no person under twenty-one shall work between half-past eight evening and half-past five morning in any cotton mill or factory worked by steam. Hours of labour are limited to twelve daily and nine on Saturdays; an hour and a half is to be allowed for meals; no child under nine to be employed. This likewise, and for the last time, applied exclusively to cotton-mills. A long series of acts have been passed since. What may be called the general law regarding labour in factories is found in the 3 and 4 William IV. cap. ciii. (1833),

7 and 8 Vict. cap. xv. (1844); wherein adult women are for the first time brought under inspection; 10 Vict. cap. xix. (1847), 13 and 14 Vict. cap. liv. (1850), 16 and 17 Vict. cap. civ. (1853), 19 and 20 Vict. cap. xxxviii. (1856), 30 and 31 Vict. cap. ciii. and cap. cxlvi. (1867); this latter introducing the new category workshops; 37 and 38 Vict. cap. xlii. (1874), and 41 and 42 Vict. cap. xvi. (1878), known as The Factory Consolidation Act, and which repealed all previous legislation. This has again been supplemented by acts passed in 1883, 1889, 1891, and 1895, and all are together known as the Factory and Workshop Act 1878-95. Special provision concerning various different kinds of factories formerly found in separate acts are now included in this general law. Act 23 and 24 Vict. cap. lxxviii. had specially regulated the employment of females and young persons in bleaching and dyeing works; 24 and 25 Vict. cap. cxvii. in lace factories; 25 Vict. cap. viii. afforded further means of enforcing regulations in bleaching works; Act 27 and 28 Vict. cap. xlviii. referred to manufactories of earthenware (except bricks and tiles), lucifer-matches, percussion-caps, cartridges, paper-staining, fustian-cutting; 30 and 31 Vict. cap. ciii. (1867) applied particularly to blast-furnaces, copper-mills, forges, foundries, manufactories of machinery, metal, india-rubber, gutta-percha, paper, glass, tobacco, letter-press printing, bookbinding, and generally to all other works in which more than forty-nine persons are employed, with exceptions in particular as to night work in blast-furnaces, iron-mills, and printing-offices. Act 33 and 34 Vict. cap. lxii. (1870) extends this act to print-works, bleach-works, and dye-works; special provisions being made for Turkey-red dyeing-works. Of newer legislation, The Factory Act 46 and 47 Vict. (1883) lays down regulations as to white-lead factories, and as to bakehouses. Act 52 and 53 Vict. (1889) relates to cotton-cloth factories, providing that precautions are to be taken against excessive humidity and the inhalation of dust by workers. In Act 54 and 55 Vict. cap. lxxv. the system of Special Rules for certain industries held to be peculiarly dangerous is introduced, and an attempt made to cope with the evils of 'Sweating' and home work. Act 58 and 59 Vict. (1895) among other things makes regulations in regard to laundries, docks and quays, and buildings in course of construction. The Factory and Workshop Act of 1901 repeals all the preceding acts on the subject and re-enacts them with some amendments. For the distinction between a factory and a workshop, the meaning of the terms child and young person, and an outline of the provisions of the act, see **WORKSHOP AND FACTORY REGULATION.**

FAECULÆ, exceptionally bright spots sometimes visible on the sun's disc. These portions have a different spectrum from the other bright parts of the sun, as well as from the maculæ or dark sun-spots. See **SUN.**

FACULTIES, COURT OF, an English ecclesiastical court, under the archbishop, which creates rights to pews, monuments, and particular places and modes of burial, and has also various powers in granting licenses of different descriptions, as a license to marry, a faculty to erect an organ in a parish church, or to remove bodies previously buried.

FACULTY, in ecclesiastical law, is a power to do something, the right to do which the law admits; or a special privilege granted by law to do something otherwise forbidden. See above article.

FAECES, the excrementitious matter evacuated by animals. It varies of course with different species of animals, according to their diet, but it also varies with the individual, although the average characters is toler-

ably constant. The main constituents are morphological elements, more or less disintegrated from the walls and passages of the alimentary canal; unassimilable parts of the food, on which the digestive process has no effect; and other portions, quite nutritious, but which have escaped digestion; minute traces of biliary matter; and a large proportion of inorganic salts and water. In disease the composition varies extremely, and mercury, iron, and other drugs administered as medicine, are easily detected. By treatment with water, alcohol, &c., various substances have been extracted, of which *excretin*, a crystalline solid, said to contain sulphur, is the best known.

FAENZA, a town in the Kingdom of Italy, in the province of and 19 miles south-west of the town of Ravenna. It is well built, being in the form of a square, divided by four principal streets, which meet in the Piazza Publica, containing the town-hall, cathedral, and a lofty tower. It is surrounded by arcades, and has fountains in the centre. The cathedral is a Gothic building, not remarkable for beauty. Faenza is supposed to have been the first Italian city in which earthenware was introduced; hence *Faience* (which see). The manufacture still flourishes here, and there is also a considerable trade in spinning and weaving silk. Faenza is connected with the Adriatic by the Zanelli Canal, opened in 1782. There are in the neighbourhood ferruginous and saline springs of considerable repute. Torricelli was born here. Faenza is a town of considerable antiquity, and, like most Italian places, it has had a chequered history. It has been frequently subjected to the fluctuations of party and the fortunes of war during the whole period of Guelph and Ghibelline controversy, and of alternate French, German, and Spanish occupation. Pop. 13,998.

FAGEL, GASPAR, a Dutch statesman, born in 1629; died at The Hague, 16th December, 1688. After the murder of the De Witts (20th August, 1672) Gaspar was appointed to succeed Jan de Witt in the office of grand pensionary, which he held till 1688. He was one of the negotiators on the part of Holland in the Peace of Nimeguen (1678), to the conclusion of which he appears to have been personally opposed. He contributed, as much as his position enabled him to do, to the enterprise of William upon England, and prepared the expedition by which he was enabled to take possession of the crown of this country, although he did not live to witness the success of the undertaking.

2. FRANS NICOLAAS, nephew of Gaspar, entered the military service in 1672, and died 1718, general of infantry in the service of the States-general, and imperial lieutenant field-marshal. He distinguished himself in the battle of Fleurus, 1690. The famous defence of Mons, 1691, was directed by him. He also displayed great military talent at the siege of Namur, at the capture of Bonn, and in Portugal, 1708, in Flanders, 1711 and 1712, at the battles of Ramillies (1706) and Malplaquet (1709). Several other members of the family have held the office of registrar to the States-general, ambassador, or other important posts.

FAGGING, a custom which formerly prevailed generally at most of the English schools, and is still practised at Eton, Winchester, and one or two other places. It consists in making the junior boys act as servants or 'fags' in the performance of multifarious menial offices for the elder boys. It has been upheld by some as exerting a beneficial influence in disciplining boys and rendering them hardy and self-reliant; but in many cases it must tend to foster an arbitrary and tyrannical spirit on the part of the elder ones, and a craven submissiveness and servility on that of the juniors. Some well-authenticated instances of

fearful cruelty to fags are recorded, and it is to be hoped that ere long the institution will be entirely abolished, as the relic of a barbarous age. Under **PENALISM** will be found a notice of similar practices in German universities.

FAGGOT-VOTE is a vote procured by the purchase of property under mortgage, or otherwise, so as to constitute a nominal qualification without a substantial basis. Faggot-votes are chiefly used in county elections. The way in which they are usually manufactured, namely, by the purchase of a property which is divided into as many lots as will constitute separate votes, and given to different persons, has given rise to the name. Sometimes properties are bought in this way, and held as a bona-fide investment for the sake of the vote.

FAHLERANZ, KARL JOHANN, one of the most famous Swedish landscape-painters, was born in 1774, at Sprengel, Stora-Tuna, in the lan of Falun, where his father was pastor, and studying nature diligently became a self-educated artist. He was acquainted only with northern scenery, but has given it with great fidelity and spirit. His principal productions are in the possession of the King of Sweden. He died 1st January, 1861.

FAHLERZ. See COPPER—c. The Gray Copper Fahlerz, or Tetrahedrite.

FAHRENHEIT, GABRIEL DANIEL, known for his arrangement of the thermometer and barometer, was born at Dantzic, May 14, 1686, and was originally designed for the commercial profession. His inclination for natural philosophy induced him to quit that business, and having travelled through Germany and England to enlarge his knowledge, he settled in Holland, where the most celebrated men in this branch of science, s^r Gravesande and others, were his teachers and friends. In 1720 he first conceived the idea of using quicksilver instead of spirits of wine in thermometers—a discovery by which the accuracy of the instrument was very much improved. He took, as the limit of the greatest cold, that which he had observed at Dantzic in the winter of 1709, and which he could always produce by mixing equal quantities of snow and sal-ammoniac. The space between the point to which the quicksilver fell at this temperature, and that to which it rose in boiling water, he divided into 212 parts; and this distinguishes his scale from Réaumur's and the Centigrade. (See THERMOMETER.) He gives an account of it in the Philosophical Transactions for 1724. This paper also contains the first notice of the fact that water can be cooled much below its freezing-point without becoming solid. About 1724 he discovered the fluctuation of the boiling-point of water, which he had made one of the fixed points of his thermometer. He was chosen a fellow of the Royal Society of London in 1724. He died September 16, 1736.

FAIENCE, a kind of fine pottery, superior to the common pottery in its glazing, beauty of form, and richness of colouring, and of which several kinds are distinguished. It derived this name, first given to it in France, from the town of Faenza, in Italy, which became famous for a fine sort of pottery called by the Italians *majolica*, because originally it came from Majorca. The majolica reached its greatest perfection between 1530 and 1560, and was made in various other towns besides Faenza (Gubbio, Urbino, Pesaro, &c.). Some pieces were painted by the greatest artists of the period, and are highly valued by connoisseurs of ceramics. In the Louvre, at Berlin, and at Dresden are rich collections of it. The term majolica is sometimes used as distinguished from faience, but more properly it is only a variety of it, other varieties being Falaisay ware, Della Robbia ware, &c. Towards the end of the seventeenth

century the town of Delft, in Holland, became famous for the manufacture of a kind of faience, hence called *delft-ware* (which see). The English stoneware has some resemblance to faience, but is, in quality, entirely different, being more or less vitrified, whereas the body or paste of faience is porous, as may be readily perceived by touching the edge of a fragment with the tongue. True faience is a fine earthenware made of coloured or white earth, covered with an enamel which is usually white, but may be coloured. This enamel is a glass rendered opaque by oxide of tin or other suitable material, and is intended not only to glaze the body, but to conceal it entirely. It was to the independent discovery of the glaze, which he had seen on some specimens, that Bernard Palissy devoted himself, and in the course of which he suffered so much that his own narrative of it is as interesting as a romance. The Arabs appear to have introduced faience into Europe, being preceded in the manufacture by the Persians and Indians. See POTTERY, CERAMICS.

FAILURE. See BANKRUPT.

FAIRFAX, EDWARD, a poet of the seventeenth century, who is regarded as one of the great improvers of English versification. The time of his birth is uncertain; his death took place in the year 1635. He was a son of Sir Thomas Fairfax, engaged in no profession, but, settling at Newhall, in the parish of Fuishtone, Yorkshire, led the life of a retired country gentleman, devoted to literary pursuits. Fairfax's reputation rests on his version of Tasso's *Jerusalem Delivered*, first published in 1600. It is written in the same stanza with the original, and combines fidelity to the sense of the author, with harmony of versification. After being for a while superseded in the estimation of the public by the inferior translation of Hooke, it has been more justly appreciated, and recent editions of it have issued from the press. Fairfax wrote eclogues and other poems not known to be extant, except two of the former. He also wrote *A Discourse of Witchcraft*, in which he was a believer.

FAIRFAX, THOMAS, LORD, a distinguished commander and leading character in the civil wars which distracted England in the seventeenth century. He was born in 1612, at Denton, in Yorkshire, being son and heir of Ferdinando, Lord Fairfax, to whose title and estates he succeeded in 1648. A strong predilection for a military life induced him to quit Cambridge, and at an early age to volunteer with the Lord Vere, under whom he served a campaign in the Netherlands with some reputation, and whose daughter he afterwards married. When the disputes between Charles I. and the Parliament terminated in open rupture, Fairfax warmly espoused the cause of the latter, and joined his father in making active preparations for the approaching contest. In April, 1642, he presented to Charles at York a petition of the people imploring him to be reconciled to his subjects. The same year he was appointed general of the horse, and he served under the Earl of Manchester at Winceby, 11th October, 1643. In 1644, together with Essex, Waller, and Manchester, he held a chief command in the English army sent to co-operate with the Scots. He defeated Colonel Wetherby, and formed a junction with the Scots on 20th April. The credit of the battle of Marston Moor has, by some authorities, been divided between Leslie and Cromwell, but, according to others, Fairfax is also entitled to share in it. At all events, on the Earl of Essex resigning the command of the parliamentary army in 1645, Fairfax was made general-in-chief in his room. He insisted on the command of the horse being given to Cromwell. After the

victory at Naseby, to which Cromwell, with his friends, again mainly contributed, he marched into the western counties, quelling all opposition as he advanced. When he took Oxford the first thing he did was to set a guard upon the Bodleian Library, an act which sufficiently indicated his opinion of his followers, and for which he deserves the gratitude of posterity. He subsequently, in November, 1647, was engaged with Cromwell in putting down the levellers in the army, and in the following year put down the insurgents in Kent and Essex; captured Colchester, and caused Sir Charles Lucas and Sir George Lisle to be tried by court-martial and shot. When the king fell into the power of the prevailing party, considerable jealousy appears to have been entertained by Oliver Cromwell and his adherents of Fairfax, who seems to have been far from wishing to push matters to the extremity to which they afterwards went. Nevertheless he still adhered to the party with which he had hitherto acted. In April, 1649, he was again occupied, with the co-operation of Cromwell, in suppressing revolt in the army. But, being ordered to march against the Scottish Presbyterians, he positively declined the command, notwithstanding the urgency of Cromwell, who declared that he would rather fight under him than command the greatest army in Europe, and Cromwell was appointed (26th June, 1650) to succeed him. He was appointed one of the lay church commissioners in 1654, and was a member of Cromwell's first Parliament. He assisted Monk against General Lambert, and co-operated in the restoration of Charles II., being one of the committee charged to secure his return. He died at Nun Appleton, 12th November, 1671.

FAIRIES, FAIRY TALES, ELVES, &c. Every child knows that fairies are a kind of good and bad spirits. The former are usually the most beautiful women in the world, the latter the most hateful monsters. They are often found present by the cradle, or in the decisive moments in life, to influence the fate of the individual. They have great power, united with great knowledge, and their wands work wonders. Still, both their knowledge and power are limited, as is also their free agency; they can only act under certain circumstances, which it is not in their power to control, for more powerful than fairy or magic influence is the mysterious working of fate. Who has not felt a desire to solve the riddle of the sometimes almost miraculous concatenation of events in life by the agency of these active sprites, and to embody the invisible agents of nature in visible forms? In an age of ignorance the imagination easily substitutes a poetical mythology in the place of natural causes. The native land of this fairy mythology is Arabia, from whence it was brought to Europe by the Troubadours. The European name *fairy* comes from *fatum*, fate. The Italians still call a fairy *fata*. Fairies are often mentioned in the traditions of the Italians, who, as well as the Arabians, had stories of a country inhabited by fairies. The poetical treatment of the fairy world was introduced into France in the twelfth century by the poem of Lancelot of the Lake. This work increased the liking for fairy legends not only in France but also in foreign countries, a task which Philip, count of Flanders (1191), contributed not a little to extend. The higher classes believed their existence as described in romances; the people saw them everywhere, but particularly in ruined castles, or such as were surrounded with forests (the fairy Melusine ruled in the castle of Lusignan); but they also dwelt around fountains and trees. They played an important part in the romances of chivalry and the *fabliaux*, and gave them a peculiar charm; they constituted their ma-

chivalry, and the romantic epics of Bolarlo, Ariosto, Tasso, and others, are not a little indebted to them. They were naturalized in England before the time of Chaucer and Spenser; and tales of their doings were so widely spread, and so fixed in the popular belief, that they did not appear extraordinary or unnatural when brought upon the stage by Shakespeare. They were easily reconciled with the Christian doctrine of good and evil spirits, and Tasso, in his Jerusalem Delivered, attempted to reduce to a poetical system these spiritual beings, partly Christian and partly heathen. In the last part of the seventeenth century the true fairy tales first became popular, and here also the Italians appear to have taken the lead. The Pentameron, by Basilio, enlarged by Alessio Abbatutis, led the way. In 1687 circumstances connected with the private history of Louis XIV. brought these tales into vogue in France, after the revocation of the Edict of Nantes, 1685; and after Perrault had published the Contes de ma Mère l'Oye, in 1697, he was immediately imitated by a multitude of authors. The learned orientalist, Antoine Galland, appears to have been led to translate the Arabian Tales, the Thousand and One Nights (see ARABIAN NIGHTS), which appeared in 1704, by the prevailing love for fairy tales. The popularity of the fairy tales appears from the multitude of similar stories which have since appeared. The best have been collected in the Cabinet des Fées (Paris and Geneva, 1786, thirty-seven vols.), the last volume of which contains an account of the authors. The principal critics of Boileau's school, who ranked judgment higher than imagination, set themselves vehemently against them; but they continued to be fashionable till satiety produced disgust. This was only temporary, however, and such admirable tales as those of Perrault, and the scarcely less admirable ones of the Countess D'Aulnoy, still retain their popularity unimpaired. See GNOME and KOBOLE.

FAIRS AND PERIODICAL MARKETS (French, *foire*, German, *Messe*). A fair is a periodical meeting of merchants in an open market held at a particular place, and generally for the transaction of a particular class of business. The origin of fairs is obviously to be traced to the convenience of bringing together at stated times the buyers and sellers of the stock-produce of a district. Fairs are generally held in or near towns, but from their nature are specially adapted to the convenience of country dealers and their customers.

Two curious facts are to be noted in the history of fairs. In Europe the numerous festivals of the church afforded the most favourable opportunity for the establishment of these markets. This association is indicated in the German name of a fair, which is identical with that used for the ceremony of the mass. A fair generally brings a concourse of people into the town in which it is held, and gives it something of a holiday appearance. Advantage has frequently been taken of this concourse, either by the persons assembled themselves or by the purveyors of various amusements, to add entertainment to business, and as the business of a particular fair declined it has often, instead of being abandoned, been gradually converted into a periodical opportunity for a saturnalia of amusement. Thus religion, business, and diversion have come to be associated in the idea of a fair. Fairs were formerly of more importance than they are now. Modern facilities of communication and correspondence, and the innumerable army of agents through whom all business negotiations are now conducted, have diminished the necessity for periodical markets, but there are still a few classes of merchandise, chiefly connected with agriculture, in which they retain, and are likely to retain, their importance. A periodical

visit to town is so obvious a convenience to country people, and that convenience is so much enhanced by a number making that visit simultaneously, that there is reason to believe that this class of fairs will not be done away with. It is, however, curious to observe that they have never been established in America; a fair there is equivalent either to an agricultural exhibition or to a ladies' fancy bazaar.

In the middle ages fairs were specially privileged and chartered by princes and magistrates, special temporary tribunals were even established for their use. It was then the custom, which in some places still remains, to make a public proclamation of the commencement and duration of the fair. The goods sold at fairs were then of much greater value, as well as variety, than at present, embracing fabrics of all kinds, as well as jewelry. In some parts of the Continent the practice still prevails of purchasing clothing at fairs. Fairs existed in ancient as well as modern times, and are to be found in all parts of the world. In the East they are of great magnitude and importance. At Mecca, during the annual pilgrimages, and at Hardwar in Ajmir, a resort of pilgrims in Hindustan, two of the greatest fairs of the East, we find again the association between commerce and religion. According to Prescott fairs were regularly held in the principal cities of Mexico every fifth day, being the recognized substitute for shops. A fair for the sale of slaves was held at Azcapotzalco, near the capital. At the principal fair, held at the city of Mexico, the number of visitors reached 40,000 to 50,000. Here the same arrangement prevailed as in the European fairs of the middle ages. A court of twelve judges, clothed with absolute authority, maintained perfect order in this great concourse.

The Easter and Michaelmas fairs at Leipzig, the fairs of Frankfurt-on-the-Main, of Lyons in France, and Nijnei-Novgorod in Russia, are among the most important fairs of the present day in Europe. The Leipzig book-fair, a very peculiar institution, is described in our article on the BOOK-TRADE. The fairs of Great Britain now mostly consist of the weekly market-days of country towns, and certain great agricultural meetings, or trysts, as they are called in Scotland, chiefly for the sale of cattle and horses, such as the Falkirk Tryst. There are also, especially in Scotland, a considerable number of hiring fairs. Among the most celebrated of the fairs which have been turned into saturnalia are the celebrated Donnybrook fair in the county of Dublin; Bartholomew and Greenwich fairs, London; and Glasgow fair. The day of these fairs is, however, already past; the tide of modern improvement has long since reached the amusements of the people, and the better means of entertainment now available have taken away the aliment from these ill-organized and tumultuous assemblages. Most of them are already extinct, and all of them are in process of becoming so.

FAIRWEATHER MOUNTAIN, on the west coast of North America, in Alaska Territory, 85 miles north-east of Cape Fairweather, which is in lat. 51° 32' N.; lon. 68° 55' W. It is one of the principal summits of the Cordillera of New Norfolk, rising, according to accurate observations, to the height of 14,900 feet above the level of the sea, and is covered with perpetual snow.

FAIRY CIRCLE, or **FAIRY RING**, a phenomenon frequent in the fields, &c., formerly supposed to be traced by the fairies in their dances. There are two kinds—one of 6 or 7 yards in diameter, consisting of a bare ring or path, a foot broad, with green grass in the middle of it; the other is of smaller dimensions, encompassed with a circumference of grass, greener and fresher than that in the middle. They are

ascribed to a kind of fungus which breaks and pulverises the soil.

FAITH, a doctrine derived from Scripture, and held generally by all churches or bodies of Christians who acknowledge the divinity of Jesus Christ. The statements on which this doctrine is founded are diffused generally throughout the New Testament, and it is not always easy either to apprehend the exact signification of each or to reconcile them with one another. It would, however, be extremely rash to adopt the view of some modern critics that these views are really inconsistent, that St. Paul, for example, does not hold the same view of faith as St. Peter; or that he developed this doctrine in a way unknown to or unanticipated by our Saviour himself. There are evident points of agreement between the divergent views of faith, between that, for example, which insists on the necessity of works and that which asserts the justifying efficacy of faith alone, seeing that St. Paul, who propounds the latter, says of himself, 'I keep under my body, and bring it into subjection, lest, by any means, after having preached to others, I myself should be a castaway;' and the subject in its own nature is so profound and so extensive that a superficial agreement on it could not fairly be looked for. From the general teaching of the New Testament some salient points may be gathered in regard to the doctrine of faith, which, although they may not comprehend all details or remove all difficulties, will give a general idea of the scope of the doctrine. It is assumed that mankind is in a state of alienation from God; that this arises from a fall from their original position which took place in the person of Adam, their original representative, in consequence of his disobedience in eating of the forbidden fruit; that in this state they are generally prone to what is evil, and even the good they do does not proceed from the right motive, the love of God; that God has designed to raise man from this position by giving him a new head and representative in the person of his only son, Jesus Christ, who for this purpose was sent into this world 'in the fulness of time' to 'fulfil all righteousness,' and to suffer and die 'as a propitiation for our sins;' that individual men are united to Christ by faith as the bond by which they come within the terms of this new covenant. Faith is represented as bringing believers into a vital union and spiritual communion with Christ, like the union of the branch to the vine, or of the members of the body to the head, from which love to God and all good works flow. Faith is preceded or accompanied by repentance, which, as well as faith itself, is the work of the Holy Spirit, the third person of the Trinity.

This is a general outline of what is believed by the great body of Christians, or by the bulk of the churches calling themselves orthodox or evangelical, but it must be allowed that at almost every point not only churches but individual theologians differ as to the definition of terms, and especially as to the extent of meaning to be assigned to them. It is not easy to determine, in particular, to what extent Catholic and Protestant divines agree in respect to faith. The doctrine of justification by faith was made by Luther, and has continued to be, a distinctive one of the Reformation. Before the Reformation there was no really definite teaching in the church regarding the true nature of justification. The earlier fathers in particular cannot be cited as consistently upholding any of the theories which were afterwards formulated, and even the later fathers of the church are not wholly consistent in their teaching on this question. The conception of merit as the ground of justification had, however, gained wide practical acceptance throughout the church previous to the

Reformation, and good works were regarded as contributing powerfully to salvation. The elaborate system of penance which had grown up during the middle ages readily connected itself with this view of salvation, and merit in the sight of God was regarded as attaching even to penance. This conception of salvation and the factors involved in it soon produced many serious abuses. Luther's work, doctrinally considered, was to separate justification from sanctification, and to declare that we are justified in the sight of God by faith, not by any merits of our own. His teaching that the ground of this justification was the righteousness of Christ imputed to us, may be regarded as a sort of concession to the Roman Catholic view. The doctrine of justification by faith was not, however, a new one, since it had been taught in some form by Catholic theologians before, as it has been since, the Reformation. With such doctrines as those of confession, penance, transubstantiation, and purgatory, it is not possible that this doctrine can hold the same place in the Catholic as in the Protestant communion; but not to speak of Pascal, who was accused of Calvinism, an accusation which he strongly repudiated, such orthodox divines as Bossuet and Massillon write on this subject in substantial harmony with Protestant divines. Bossuet, with that comprehensiveness of view for which he was distinguished, asserts the unity of the faith in all ages. The church before Christ, according to him, looked forward to his coming as the church since has looked back on it as the ground of its faith. Milton, with a higher generalization than Bossuet's, applying the reasoning of St. Paul, unites angels and men, by the bond of faith, to Christ as a common head.

FAKIR, a kind of fanatic in the East Indies, who retire from the world, and give themselves up to contemplation. They endeavour to gain the veneration of the people by absurd and cruel penances. Some roll themselves in the dirt. Others hold an arm raised in one position so long that it becomes withered, and remains fixed in this position for life. Others keep the hands clasped together so long that the nails grow into the flesh, and come out on the other side. Others turn their faces over the shoulder, or their eyes towards the end of the nose, till they become unchangeably fixed in this direction. They make a vow of poverty, and to live at the expense of the faithful. Some of them, however, possess money and land. There are Mohammedan and Hindu fakirs: the number of the former is considerable. The Hindu fakir who has reached a certain stage of perfection becomes *Sanyasi*. This degree of perfection seems to consist chiefly in illness and dirt; those who have attained it are dispensed even from religious worship. The self-torture to which these wretched devotees submit is almost beyond belief. Besides the penances already mentioned, standing with the hands raised above the head, or in some painful position, for protracted periods—passing between four fires, representing the cardinal points, with a fifth in the middle to represent the sun—dragging heavy chains—living in iron cages—are among the means they adopt of reaching the imagined goal of their devotion. Mendicancy, of course, forms an essential part of their observances.

FALAISE, a town, France, department of Calvados, picturesquely situated on a rocky precipice, 23 miles S.W. of Caen. It consists of three distinct parts, the high town, town proper, and suburbs; is surrounded by old walls, and though irregularly and indifferently built, contains several objects of interest, among others the ruined castle of the dukes of Normandy, where William the Conqueror was born. The manufactures are chiefly cotton goods, lace,

leather, and paper; and the trade, chiefly carried on at the six annual fairs, one of which lasts fifteen days, is of considerable importance. Falaise was an important fortress early in the eleventh century, and was frequently besieged and taken, until it was dismantled by Henry IV. in 1590. Pop. (1896), 7419.

FALASHAS. See ABYSSINIA.

FALCON. The Falconidae (or Accipitrines) form one of the two divisions of diurnal birds of prey, and include falcons, hawks, and eagles. They have the head and neck covered with feathers. With the exception of the ospreys they have projecting eyebrows, which give their eyes a sunken appearance. The colour of the plumage frequently differs much in the young from that of the full-grown birds, and as their first plumage is retained for some time, this has caused more species to be enumerated than really exist. The female is generally a third larger than the male. Nearly all of them subsist on living prey, but they differ in the boldness of their pursuit of it. Subjoined is a notice of the leading species of the falcons proper. For the other species see **EAGLE** and **HAWE**. The falcons proper (genus *Falco*), for strength, symmetry, and powers of flight, are the most perfectly developed of the feathered race. They are distinguished by having the beak curved from the base, hooked at the point, the upper mandible with a notch or tooth on its cutting edge on either side, wings long and powerful, the second feather rather the longest, legs short and strong. The largest European falcons are the jerfalcon or gyrfalcon proper (*Falco gyrfalco*), a native of the Scandinavian Peninsula, and the Iceland falcon (*F. Islandus*); to which may be also added the Greenland falcon (*F. Greenlandicus* or *candicans*), which, as well as the Iceland falcon, has been shot in the British Islands. Between these three species much confusion at one time prevailed, but they are now distinctly defined and described. In the Greenland falcon the prevailing colour at all ages is white, in the Iceland falcon dark—being brown or gray according as the bird is young or old. The former has the upper surface adorned with heart-shaped spots or transverse blotches of black or very dark slate-colour, the head being pure white or slightly streaked; in the latter the dark colour is the ground of each feather, on which the light marking stands out. The latter has also the bill and claws darker. The Iceland falcon more nearly resembles the true gyrfalcon of Norway, but, as a rule, the former has the crown of the head much lighter than the back, while the latter has them both of the same colour, or the crown darker than the back, and the bird altogether is generally darker, rather smaller, but with a longer tail. The average length of any of these falcons may be stated at about 2 feet. The Greenland species used to be the most highly prized by falconers. Its food consists chiefly of ptarmigans, hares, and water-fowl. It is found over a wide range of northern territory. The Iceland falcon breeds in Greenland as well as in Iceland. Cranes and herons were considered to furnish the best sport with these large falcons in former times, and they are still sometimes used for catching hares and rabbits. The peregrine falcon (*F. peregrinus*) is not so large as the jerfalcon, but more elegant in shape. The female is about 17 inches long and $3\frac{1}{2}$ feet in extent of wing; the male is 2 or 3 inches less. The head, neck, a patch under the eye, and the whole upper surface is dusky, with gray and brownish shades; the throat and under parts whitish or cream-coloured, with dusky bars and arrow-heads; legs and feet yellow, bill bluish. It chiefly inhabits wild districts, and nestles among rocks. It preys on grouse, partridges, ptarmigans, pigeons, rabbits, &c. Its flight is exceedingly swift, said to be as much as 150

miles an hour. The peregrine falcon was one of those most frequently used in falconry. Another British falcon is the hobby (*F. subbuteo*). It is a summer visitant to this country, arriving in April. It builds in tall trees, and sometimes it makes use of the deserted nest of a crow or magpie. It haunts the cultivated parts of the country, and its favourite prey is the lark. It is very strong-winged, and was a great favourite for the chase of small game when falconry was in fashion. The upper parts are grayish black, the feathers having lighter margins, the chin and throat white, belly dull orange marked with arrow-head spots, quills dusky black. The merlin (*F. aesalon*) is a beautiful little falcon, and remarkably swift and spirited. It is about 1 foot long, and weighs scarcely 6 oz. It frequents moors, and constructs its nest in rocky places or in a bush. The kestrel (*F. tinnunculus*) is one of our most common falcons. It preys chiefly on mice, beetles, moths, and small birds. It is 2 inches longer than the hobby, but has the same stretch of wings, and its bill and claws are weaker. The female is reddish-brown on the whole of the upper parts, with arrow-head dusky spots on the head, back, and wing-coverts, and dusky bars on the tail, the tips of the feathers being margined with cream-colour. The under parts are reddish cream-colour with dusky lines. One of the peculiarities of the kestrel is its habit of poising itself and hovering almost immovably over a certain spot, whence its popular name *wind-hover*. The *Gampsonyx* is a small Brazilian falcon; and two species of *Hierax*, found in Java and Manilla, are scarcely larger than a swallow, but distinguished for their spirit and energy. The flight of the falcon is very rapid. It rises to a great distance, and darts down perpendicularly on its prey. Hence its use in falconry (which see). The falcons attain to a great age. One is said to have been found in France, about 1790, with a collar of gold dated 1610, showing it to have belonged to James I. of England.

FALCONE, ANCELLO, one of the most distinguished Italian battle painters, was born at Naples in 1600, studied along with Salvator Rosa under Spagnoletto, and afterwards founded for himself an academy, which was numerously attended. Being of a restless and impassioned character he took part in the insurrection of Masaniello, and afterwards became the leading member of a secret association, the discovery of which obliged him for a time to seek an asylum in France. His paintings, consisting chiefly of battle-pieces, are highly esteemed, but very rare. He died at Naples in 1665.

FALCONER, HUGH, botanist and palaeontologist, was born at Forres, in Morayshire, 29th February, 1808. He studied arts at King's College, Aberdeen, from 1822–25, and medicine in Edinburgh from 1828–29, taking the degree of A.M. from the former, and of M.D. from the latter university. He received an appointment of assistant-surgeon on the Bengal establishment of the East India Company, but until he had attained the required age of twenty-two he filled up his time with his favourite studies of botany, geology, and palaeontology. Immediately on his arrival in India (September, 1830) he examined and reported on a collection of fossil bones from Awa, which gave him a recognized standing among the scientific men of India. In 1832 he was made superintendent of the botanic garden at Saharanpur. He discovered the true geological character of the Sewalik Hills, and by means of it defined their boundaries relatively to the Himalayas in a way which has since been generally received. In order to investigate the calciferous deposits found there in 1834 by Lieutenants Baker and Durand, he procured skeletons of extant species for comparison. For these researches he received

the Wollaston Medal of the Geological Society of England. He was next engaged in introducing tea cultivation in the northern provinces of Bengal. The government, at his suggestion, introduced plants from China, and formed experimental nurseries, which were placed under his superintendence. In 1837 he was ordered to accompany Burnes' second mission to Cabul. His health having given way, he visited England in 1843. Here he was employed by the court of directors and the trustees of the British Museum in arranging an extensive collection of the Sewalik fossils and other Indian remains, and in the publication of an illustrated descriptive work entitled *Fauna Antiqua Sivalensis*. He returned to India early in 1848, arriving in Calcutta in February. During his residence in England he had been chosen F.R.S. in 1845, and superintendent of the botanic garden at Calcutta in June, 1847. In 1850 he was deputed to visit and report on the teak forests of Tenasserim, which were being exhausted with reckless felling. In 1855 he retired from Indian service, and returned to England by way of Palestine and Syria. At home he resumed his palaeontological investigations, and took particular interest in discoveries relating to the antiquity of the human species. He died in London, 31st January, 1865.

FALCONER, WILLIAM, an English poet and writer on naval affairs, was born at Edinburgh about 1730. He went quite young to sea, in the merchant service, in which he rose to the situation of second mate, when the vessel to which he belonged was cast away, and he was thus furnished with the incidents of the Shipwreck, which was published in 1762. It was dedicated to Edward, duke of York, by whose patronage the author was appointed a midshipman in 1763. In 1769 he published a *Universal Marine Dictionary*. The same year he sailed for Bengal in the *Aurora* frigate, which was never heard of after she quitted the Cape of Good Hope. The subject of the Shipwreck is a voyage from Alexandria, in Egypt, for Venice, cut short by the catastrophe, which is represented as having happened near Cape Colonna, on the coast of Greece. The versification is varied and harmonious; the descriptions are drawn from nature; the incidents well told, and calculated to excite the sympathy of the reader. His other poems have little merit.

FALCONET, ÉTIENNE MAURICE, a celebrated French sculptor, was born in 1716, in humble life; and, displaying a natural taste for the fine arts, he was assisted in his studies by Lemoine. Catharine II. of Russia patronized him, and he was employed by her to execute the colossal statue of Peter the Great, erected at Petersburg, which occupied him twelve years. He wrote notes on the thirty-fourth and thirty-fifth books of Pliny's *Natural History*, *Observations on the Statue of Marcus Aurelius*, and other works relating to the arts, printed together in six vols. 8vo (Paris, 1781). Falconet died at Paris in 1791.

FALCONRY. Falconry is a very old amusement in Europe and Asia. In the middle ages it was the favourite sport of princes and nobles; and, as ladies could engage in it, it became very prevalent, particularly in France. In an old poem on forest sports, by the chaplain Gasse de la Bigne (*Roman des Dévotions*), cited by Curne de Sainte-Palaye in his work on chivalry, in a comparison of hunting with falconry, it is mentioned, as a particular advantage of falconry, that queens, duchesses, and countesses are allowed by their husbands to carry the falcon on their wrists, without offending propriety, and that they can enjoy all the sport of this kind of hunting, whilst, in hunting with hounds, they are only allowed to follow by the wide roads or over open fields, in order

to see the dogs pass. The knight was anxious to pay his court to the ladies, on such occasions, by his attentions to the falcons. He was obliged to be careful to fly the bird at the proper moment, to follow her immediately, never to lose sight of her, to encourage her by calls, to take the prey from her, to caress her, to put on the hood, and to place her gracefully on the wrist of his mistress.

In Germany falconry was honoured as early as in the times of the Emperor Frederick II. He was so fond of this sport that he would not even give it up during the labour of war, and wrote a work on falconry, to which notes were added by his son, Manfred of Hohenstaufen (*Reliquia Librorum Fred. II. de Arte venandi cum Avibus*, edited by J. G. Schneider, Leipzig, 1788, two vols. 4to). In the feudal usages we also find many proofs of the esteem in which the sport was held in Germany, England, and France. In Germany there were fiefs called *Habicht-lehnen* (hawk tenures), and as early as the fourteenth century some vassals were obliged to appear annually with a well-trained falcon, or hawk, and a dog trained to assist in the same sport.

In France falconry was most practised in the reign of Francis I., though this king, called the *father of hunting*, preferred the chase. The establishments for training falcons were under the direction of a grand falconer, who received an annual income of 4000 livres, and had under him fifteen noblemen and fifty falconers. He had the care of more than 800 falcons, and enjoyed the privilege of hawking through the whole kingdom at pleasure. He received a fine for every falcon which was sold, and no falconer was allowed to sell a bird without his permission. The whole establishment, which cost annually about 40,000 livres, followed the king, as did also his hunting establishment. One gentleman who was distinguished for his skill in hawking, was loaded with favours by the king, and enabled to keep sixty horses for his falconry alone. There was an old rivalry between the falconers and the hunters. When the hunting of the stag began, and the falcons mewed, the hunters drove the falconers from the yard; whilst in winter, when the stags are no longer worth hunting, the falconers retaliated on the hunters, and locked up the hounds. Falconry continued in favour until the seventeenth century; but the invention of firearms gradually superseded it.

In England falconry was also in great favour, and there is to this day a hereditary grand falconer, the Duke of St. Albans, one of the duties of whose office is to present the king with a cast (or pair) of falcons on the day of his coronation. Attempts have recently been made to revive the sport in England, and with some success in certain localities; but it is hardly consistent with the usages of the time, and more especially on account of the general inclosure of the fields. In the East, the Persians are particularly skilful in training falcons. They hawk after various kinds of birds, and even after gazelles. The falcons are taught to fasten themselves on the heads of these creatures, and to peck at their eyes, which checks them until the hounds come up. Among the Kirghiz, eagles are trained to attack wolves in a similar manner. The training of a hawk is a matter requiring great pains and protracted attention. Young nestling hawks or *eyases* are more easily tamed than wild passage birds. They must be well fed, while the feathers are growing, on tender beef, rabbits, poultry, &c. It is also important that the feeding should be regular, for otherwise what are called *Auger-traces* will appear on the feathers. The legs are kept bound with *jesses*, or slender thongs of leather terminated with bells, and during the time when they are learning to fly the birds are allowed considerable

freedom. When they begin to have considerable powers of flight they are attached to a block, as a perch, by a leash fixed to the leg. It is at this stage that the chief part of the training begins, and from this point the passage bird and the eyes are treated alike, though the former requires greater care and attention. When a bird allows itself to be hooded without resistance it is considered tame. The bird may now be taken into a garden or paddock and placed on the turf. Its hood is lifted, and the falconer presents it with a morsel of meat. If it leaps on the hand of the trainer to receive it, its education is considered far advanced, and he now endeavours to accustom it to the *lure*. This may be a piece of leather, to which the wings and feet of a bird are attached to make it resemble the falcon's prey. To this a piece of meat is attached. Its use is to recall the bird when it is allowed to fly into the air. The lure, in order to make the bird thoroughly accustomed to it, is made the means of conveying to it all its food. The bird is also taught to obey the voice of the falconer, without which precaution even the lure would be insufficient. When it has been taught to fly to the lure it is carried to the open field, and, being attached to a cord 60 or 70 feet long, it is uncovered, and shown the lure at a little distance. If it flies to it it is fed; the next day it is tried at a greater distance, and when it flies to the lure at the full distance of the cord it is considered fully tried. It is then practised in the mode of seizing its quarry, which is done with a living animal attached to a peg. It is then made to fly at an animal that is at liberty, and when it is fully trained it is used for sport. It is always kept hooded during excursions, until it is wanted to fly. See *Salvin and Brodick's Falconry in the British Isles* (1873), *Micball's Art and Practice of Hawking* (1900), and the volume on *Coursing and Falconry in the Badminton Library*.

FALERII. See **FALISCI**.

FALIERI, MARINO, Doge of Venice, born in 1278, commanded the troops of the republic at the siege of Zara in Dalmatia. He there gained a brilliant victory over the King of Hungary, and was afterwards ambassador to Genoa and Rome. He was elected Doge of Venice on 11th October, 1854, but in the following year dissatisfaction with the light punishment imposed upon a noble who had insulted his young wife caused him to conspire with the lower orders to overthrow the republic and make himself sovereign of the state. His plot was discovered on the night before it was to have been consummated, and he was beheaded 17th April, 1855. The last scenes of his life are depicted in Byron's tragedy of *Marino Falieri*. Plays have been written on the same subject by Casimir Delavigne and Swinburne.

FALISCI, a people of Etruria, occupying the city Falieri, one of the twelve Etruscan cities. An anecdote of Plutarch respecting them has been often repeated, and forms the subject of various works of ancient art. See **CAMILLUS**, **ETRURIA**.

FALKIRK, a market town and parliamentary burgh of Scotland, in the county of Stirling, 2½ miles west by north of Edinburgh, situated on a gentle eminence in a beautiful and fertile district, and with a station on the North British Co.'s line from Edinburgh to Glasgow. The public edifices of note are the parish church, the county buildings, the burgh buildings, the town-hall, the post-office, the science and art schools, the free library, and a cottage hospital. The town has large iron-works, a brewery, brick and tile works, large saw-mills, &c. In the vicinity are quarries, collieries, chemical works, brick

and tile works, a distillery, pyroligneous acid works, &c.; and near the town are the large iron-works of the Carron Company. Falkirk is connected with the port of Grangemouth by a railway 3 miles long. The so-called *trysts* of Falkirk are the greatest cattle-fairs in Scotland. They are held on a dry, sandy, level moor or heath, in the adjoining parish of Larbert, about 2 or 2½ miles north from Falkirk, on the second Tuesday of August, September, and October. At the first tryst there are generally about 4000 head of cattle present, and about 400 horses and ponies; at each of the second and third trysts there may be present about 17,000 cattle, 20,000 sheep, and 700 horses and ponies. In recent years, however, these trysts have lost a good deal of their importance. Falkirk is of great antiquity, and is associated with many interesting and remarkable historical events. The wall of Antoninus, now known as Graham's Dike, passed near the town. On July 22, 1298, a battle was fought a little north of the town between the forces of Edward I. and those of Sir William Wallace, in which the latter were defeated. (See next article.) About 1 mile south-west from the town another battle was fought, on January 17, 1746, between the Highlanders under Prince Charles and the royal forces under General Hawley, in which the former were victorious. Falkirk unites with Linlithgow, Lanark, Hamilton, and Airdrie, called the Falkirk district of burghs, in returning a member to the House of Commons. The Union Canal passes within half a mile of the town, and the Forth and Clyde Canal intersects the northern part of it. Pop. in 1891, 19,769; in 1901, 29,271.

FALKIRK, BATTLE OF. Wallace's victory at Stirling in 1297 had broken the English superiority in Scotland. In the following year Edward led a powerful army into the country. It is said to have contained 7000 to 8000 mounted men and 80,000 footmen. Against this array Wallace could oppose no adequate force. He adopted the common policy of the Scots—that of wasting the country and retreating. This had nearly proved successful, as it was difficult to maintain so large an army in an enemy's country already stripped by its defenders; but two Scottish knights, it is said, sent word to Edward where Wallace's army was to be found. The English instantly prepared for an attack, and on the 22nd of July the battle took place. The position of Wallace's army was on an inclined plain, with the horse, about 1000 in number, in the rear. His whole force only amounted to about a third of the English army. As frequently happened in their battles with the English, the Scotch showed great skill in formation. Their infantry was drawn up in circles, the men in the outer ring kneeling and holding their lances obliquely. The archers occupied the centre of the circles. The overwhelming superiority of the enemy's horse, however, decided the battle. The circles were broken one after the other, and nothing was left but to retreat. Wallace retired with a small body to Stirling, but the bulk of his army was broken up and destroyed. He himself seems soon after to have temporarily retired from the kingdom.

FALKLAND, an ancient royal burgh of Scotland, county of Fife, 8½ miles south-west of Dunfermline, at the foot of the East Lothian Hill, which rises abruptly over it. The town consists principally of a single street; many of the houses are thatched, and of an antique appearance. Falkland was long a favourite residence of the Scottish kings, and has in consequence obtained a prominent place in Scottish history. The only object of interest, however, which it now possesses is its ancient palace, begun, it has been supposed, by James II., and completed by James V.

who died here in 1542. Mary and James VI. resided here from time to time, and it was visited by both Charles I. and II. Along with a modern residence it now belongs to the Marquis of Bute. There was an ancient castle here also, in which David, duke of Rothesay, eldest son of Robert III., was imprisoned and, it is said, starved to death; but no trace of it now remains. Falkland was erected into a royal burgh by James II. in 1458. It gives the title of viscount to the English family of Carey or Cary. Pop. in 1891, 1045; in 1901, 809.

FALKLAND, LUCIUS CARY, VISCOUNT, one of those rare characters who serve as proverbial instances of social excellence, was born about the year 1610. Being carried young into Ireland he received part of his education at Trinity College, Dublin, and part at St. John's College, Cambridge. His youth did not pass without irregularities, but they were suddenly closed by his marriage with a young lady of small fortune, whom he passionately loved. After passing some time abroad he returned home, and devoted himself to a life of retirement and the cultivation of polite literature. In 1683 he succeeded his father in the peerage. For some years after this he chiefly resided at his seat of Burford, near Oxford, which he made a kind of academy of learned men, being continually surrounded by the scholars from the neighbouring universities, and visitors from London. Here it was that Chillingworth composed his famous work against popery; and questions of morals, theology, and literature were discussed in a congenial circle with the utmost freedom. Lord Falkland himself was deeply read in works of controversy. In 1639 he joined the expedition against Scotland; and in 1640, his peerage being Scottish, he was chosen member of the House of Commons for Newport, in the Isle of Wight. In the first instance, like many of the most honourable characters of the day, he warmly supported the Parliament party. He spoke with severity against Finch and Strafford, and was so disgusted with the proceedings of Laud that he concurred in the first bill for depriving the bishops of a vote in the House of Lords. A strong attachment, however, to established forms, and some doubts of the ultimate objects of the parliamentary leaders, caused him to retract; and he afterwards strongly opposed the same measure. He still, however, kept at a distance from the court; but his high character rendered it so great an object to gain him over to the king's service, that at length he was induced to accept a seat in the council and the office of secretary of state. While in office he refused to employ spies or open suspected letters. He very decidedly embraced the party of the king when hostilities commenced, and attended him at the battle of Edgehill and the siege of Gloucester. A view, however, of the evils impending over the country, and very probably a conviction of sinister objects on both sides, broke his spirits. He would frequently sit abstracted among his friends, and sighing deeply, exclaim, 'Peace, peace!' and exhibit every sign of grief and anxiety. His closing scene almost proves a determination to die in battle, as he volunteered his services at the battle of Newbury without a command, and putting himself in the front rank of Lord Byron's regiment, was struck from his horse by a musket-shot, and was found the next day dead upon the field. Such was the fate of Lord Falkland, at the age of thirty-four; and while the universal praises which he has received are, doubtless, very much owing to the elaborate character drawn of him by his friend Clarendon, there can be no doubt of the strict integrity of his character and intentions. As a man of active talent he claims little admiration, and was evidently framed for that life of studious

retirement and mental culture in which he so long delighted. One of his sayings marks his taste and character—'I pity unlearned gentlemen on a rainy day'. Lord Falkland left behind him several published speeches and pamphlets on political and theological subjects, as also a few poems.

FALKLAND ISLANDS (French, *Malouines*; Spanish, *Malvinas*), an island group belonging to Great Britain, in the South Atlantic Ocean, east of the Straits of Magellan; lat. 51° to 53° S.; lon. 57° to 62° W. They consist of two large islands, East Falkland and West Falkland, with a great number of smaller ones, about 100, surrounding them. Their area is about 6500 square miles, of which East Falkland contains 3000 and West Falkland 2300 square miles. They are hilly and boggy. There are no aborigines. The climate is described as very healthy, though a large proportion of the days are cloudy and tempestuous, the winds here being exceedingly frequent, violent, and changeable. The whole group is deeply indented by bays and creeks, often reducing the intervening land to a series of narrow peninsulas. There is a total want of trees, and looking from the higher ground the eye sees nothing but a vast moorland intersected by sluggish streams and pools of yellowish-brown water. Grass grows very luxuriantly, the variety called *tussock* being from 6 to 10 feet high, and the short grasses are very nutritive. The chief industry is the rearing of sheep, for which the islands are very well adapted, and cattle. Immense numbers of penguins frequent the islands, and are boiled down for their oil. The sealing trade is also carried on, but the supply of seals is now almost exhausted in these seas. The exports (mainly wool, with sheep skins and carcasses, tallow, &c.) amount to about £125,000 or £130,000 per annum.

The Falkland Islands were discovered by Davis on the 14th August, 1592. They were afterwards visited (1690) by Strong, who gave them the name which they now bear. In 1710 a French vessel from St. Malo touched at them, and named them *Iles Malouines*. Settlements were afterwards formed on them by the French, Spaniards, and English alternately, but the latter have ultimately retained possession of them. A British settlement called Stanley was formed in East Falkland in 1853; West Falkland was settled in 1861. Stanley is now a village, and contains the residence of the governor and a jail. There is an excellent harbour here, in which considerable numbers of vessels take shelter from storms or obtain repairs. Pop. of the group (1881), 1553; (1894), 1902.

FALLACY (logic) is when an argument is used as decisive of a particular issue, which in reality it does not decide. Fallacies are variously classified by different logicians. A fallacy may either exist in the substance or in the form of the argument. If it exists in the substance it does not belong to logic, as commonly understood, to expose it; but logicians differ as to what constitutes the proper distinction between form and substance. J. S. Mill in particular extends the sphere of logic in respect to the treatment of fallacies beyond what has been usually assigned to it. Among the fallacies enumerated by logicians are the *petitio principii*, or begging of the question; *ignoratio elenchis*, or mistaking the point at issue; the *argumentum ad hominem* (retort), and the *argumentum ad verecundiam* (appeal to authority), when applied to prove a position; and all violations of the syllogism.

FALLING STARS. See METEORS.

FALL OF BODIES. All bodies on the earth, by virtue of the attraction of gravitation, tend to the centre of the earth. If this tendency acts freely, the body falls towards the earth; if it is opposed by a

obstruction, pressure ensues; if the tendency is partly checked and partly efficient, pressure and descent both ensue. A ball held in the hand presses downward; if dropped, it descends perpendicularly; if placed on an inclined plane, it rolls down, in doing which it presses the plane with a part of its weight. The laws according to which this motion takes place were formerly the subject of the most erroneous theories. According to the physics of Aristotle, the velocity of the fall of bodies is in proportion to their weight. Consequently any body should fall with ten times more velocity than another which is only one-tenth part as heavy. This error Galileo attacked while a student in Pisa. Soon after his appointment to a professorship, he declared himself against this and other maxims of the Peripatetic philosophy. He ascended the cupola of the lofty tower at that place, and dropped bodies of very unequal weight, which, if their specific gravity did not differ too much, were found to reach the ground at nearly the same time.

These ancient notions were eventually overturned completely on the invention of the air-pump. By means of the celebrated *guinea and feather experiment* it is shown that a guinea and a feather fall side by side in the vacuum of the air-pump, and that the sole reason why the feather lags behind so much under ordinary circumstances, is that it exposes a surface disproportionately great to the resistance of the air. Rightly understood, this experiment proves that in the bodies that we are acquainted with the *force of gravitation is proportional to their inertia, that is to their mass*, a proposition which is often tacitly assumed or not recognized at all, but which could not be proved except by experiment. (See GRAVITY, FORCE OR.) This being understood, the laws of the fall of bodies, under the influence of the force of gravity, are very simple. The case that is generally contemplated under the name 'laws of falling bodies' is that of a body falling freely, in a straight line, and through a distance short in comparison with the distance from the centre of the earth. Such motions, therefore, as that of a pendulum swinging under gravity, or of a projectile whose motion is curvilinear, are not considered here; while the distance fallen through is taken to be so short that the force of gravity may be regarded as constant during the whole motion. Under these circumstances the following are the laws of falling bodies:—

1. When a body falls from rest it acquires velocity at the rate of about 32·2 feet per second. This number, which represents the acceleration due to the force of gravity, varies slightly with the locality, increasing from the equator to the poles, and diminishing as we recede from the centre of the earth (see GRAVITY, FORCE OR); it varies but little, however, from the number just given. At the end of five seconds, therefore, the body would be found to be moving at the rate of $5 \times 32\frac{1}{2}$, that is 161 feet per second.

2. The space fallen through in the first second is half of 32·2, that is 16·1 feet; and the space fallen through in any given time is found by multiplying the square of the number of seconds by 16·1. Thus in three seconds a body falls $9 \times 16\frac{1}{2}$ feet, or 144·9 feet. The following very convenient rule may be given, if we take, instead of 16·1, the number 16 as a sufficiently close approximation:—the number of feet that a body falls in any given time is equal to the square of the number of quarter seconds. Thus in the case above, 3 seconds, the number of quarter seconds is 12, and the square of 12, or 144, is the number of feet the body falls in the time.

3. The square of the velocity acquired by falling through any number of feet is found by multiplying twice that number by 32·2. Thus if a body falls 9 feet, the square of the velocity acquired is $2 \times 32 \times 9$,

or 576 feet per second, 32 being used instead of 32·2; and taking the square root of 576, we find that a velocity of 24 feet is acquired in a fall of 9 feet.

4. When a body is projected vertically upward with a given velocity, it continues to rise during a number of seconds found by dividing the number that expresses the velocity of projection by 32·2; and it rises to a height found by dividing the square of that number by $2 \times 32\frac{1}{2}$, or 64·4.

FALL OF MAN, a commonly received doctrine of Christianity, founded upon the historical narrative contained in the third chapter of the book of Genesis, together with the allusions to the same matter in other parts of Scripture. The history of the fall, as given in Genesis, contains the following particulars:—God having placed our first parents, Adam and Eve, in the garden of Eden, and forbidden them under pain of death to eat of the fruit of one of the trees of it, called the tree of the knowledge of good and evil, Eve, tempted by the serpent, first ate of the fruit herself, and afterwards gave of it to her husband, who followed her example. Both were now driven out of Eden. Punitive sentences were passed upon each of them, and upon the serpent, which is alluded to by St. Paul as representing the devil. In the subsequent narrative the consequences of the fall significantly appear. The first man born of the original pair is a murderer, and his descendants grow in wickedness until a flood is sent to carry them away.

As might be expected, this most suggestive narrative has given rise to inexhaustible controversy. The opinions on the fall may be divided into three classes: those which reject the narrative altogether; those which accept it as a mythical or allegorical account of the origin of evil; those which regard it as in the main historical. With regard to the first class, as we do not purpose to enter here on a defence of the authority of Scripture, nothing more need be said of them. Those holding the second class of opinions naturally differ nearly as much among themselves as they do with the holders of the other opinions. It may be observed of them generally, that when they extend beyond allegorizing some particular point or circumstance in the narration, they receive little countenance from the sacred narrative itself. As a mere matter of literary criticism, the uninterrupted flow of the narrative down to times and events evidently historical, together with the uniformity and sobriety of its style, leave little ground for the supposition that the writer himself supposed he was dealing in allegory.

The historical view of the fall, besides the theoretical controversies to which it gives rise as to its account of the origin of evil, encounters difficulties from two sources—the modern sciences of chronology and ethnology. In the meantime these remain difficulties only, as these sciences are by no means in a state of sufficient maturity to allow their conclusions to be absolutely applied; but we shall not here enter upon difficulties of any kind, contenting ourselves with an account of the doctrine as given by Christian theologians.

Even here the ground is not free from controversy, for we do not find that the language of creeds is always that of the most eminent theologians even of the churches acknowledging those creeds. In the former we are told of a radical change in man's nature; of his being born in a condition which renders him subject to the wrath of God; and of his being in his natural condition wholly incapable of what is good, and continually intent only on what is evil. It may here be observed as a point to which the attention of modern critics who find so much discordance between the various writers of Scripture has not been sufficiently directed, that numerous as these writers are, and various as are the times and

circumstances in which they wrote, there is a striking conformity in the views they give of the natural condition of man. These views appear to justify, and indeed have suggested, the language of creeds on this subject.

It has occurred, however, to many theologians that this seemingly accurate condensation of scriptural statements in regard to man's condition as a fallen creature was not only open to many objections from reason, but rendered a consistent interpretation of Scripture itself difficult, if not impossible. It seems, for example, impossible to reconcile the constant appeals made in Scripture to the moral nature of man with the notion that that nature is inherently and radically corrupt. It would also appear that the statements of Scripture with regard to the actual moral condition of man, strong as they are, do not absolutely require this mode of accounting for them. Without supposing any radical change of man's moral nature, or even any change of it whatsoever, it is only necessary to suppose a change in his relation to God to explain all that is said regarding him. It is supposed that man's moral nature consists of capabilities which are good or bad according as they are directed, and that God himself is the object of all its highest aspirations. The fall being supposed to consist in the alienation of man from God, it is easy to perceive that all these aspirations, being deprived of their proper objects, must apply themselves to improper ones, and become evil in their tendency; hence the sudden rise of pride, selfishness, ambition, and all evil passions. In as far also as man's nature is affected by the hereditary transmission of qualities it might become actually vitiated in its tendencies, and this, together with the accumulation of evil habits, would produce those climaxes of violence or corruption which have from time to time convulsed or disintegrated society, which have called forth the denunciations of prophets, and by their very excesses have produced a reaction, which, however, has left human nature as incompetent to guide itself as ever, and ready, after a period of repose, to progress towards another crisis. The fall, according to this view, consists in the moral inadequacy of man's nature when left to itself, and the actual evils flowing from this inadequacy.

It is argued by theologians that in the original sentence pronounced on the transgressors there is contained the promise of a redemption, and they maintain that the whole scope of Scripture is directed to the development of this promise, and of the scheme of providence associated with it. It is from the New Testament, however, and not from the Old, that the whole doctrine of the fall has been built up. Everyone knows that Milton has seized on this as the groundwork of his two great poems. See ADAM AND EVE, ORIGINAL SIN.

FALLOPIAN TUBES, in anatomy, are two ducts which open by one extremity into the womb, one at either angle of the fundus, and terminate at the other end in an open trumpet-shaped mouth, which at certain times grasps the ovary and receives the ovum. They are named after Fallopius (see next article), who first recognized their functions.

FALLOPIO, GABRIELLO (usually known as FALLOPIUS), a celebrated Italian anatomist, is said to have been born at Modena about 1523. He studied at Ferrara and at Padua, at which last place he is said to have attended the lectures of Vesalius. He became professor at Ferrara, whence, in 1548, he removed to Pisa. He continued there three years, and was then made professor of surgery, anatomy, and the *matéria medica* at Padua, where he remained till his death in 1562. The principal work of Fallopius is his *Observationes Anatomicae* (Venice, 1561, Vol. V.

8vo), which, as well as his other writings, has been several times reprinted. He was the first anatomist who accurately described the vessels and bones of the fœtus; and his account of the Fallopiian tubes in females has perpetuated his name.

FALLOW LAND is ground that has been left uncultivated for a time, in order that it may recover itself from an exhausted state. The term fallow, derived from the Anglo-Saxon *feallow*, seems to indicate the colour of bare or ploughed land. The Romans alternated fallow with wheat crops. In modern agriculture a much longer rotation, varying from four or five to seven or eight years, is adopted, and manure is much more freely used. The specific object of fallowing is to clean the soil, which is not only exhausted but fouled by a continued succession of white or corn crops. Strictly speaking, fallow ground is left altogether without crops; but in agricultural usage strict fallow is not always adopted, and the term fallow is applied to various modes of treatment, of which at least three distinct varieties are recognized, *bare fallow*, *bastard fallow*, and *green-crop fallow*. Bare fallow is that in which the land remains completely bare for a whole year; in bastard fallow it is ploughed up and worked after the removal of a spring or summer crop, preparatory to the sowing of a root or forage crop, to occupy the ground during autumn or winter; in green-crop fallow the land is sown with a root-crop, placed in rows far enough apart to admit of the intermediate spaces being stirred, pulverized, and cleaned, during its growth, by horse or hand implements. Ploughing and stirring the land, so as to admit air to decompose organic matter and form new soil, is of indispensable importance in fallowing.

FALL RIVER, a city, Bristol county, Massachusetts, United States, on an arm of Narraganset Bay, at the mouth of the Taunton River, 53 miles S.W. of Boston, with which and with Newport it is connected by railway. It stands on high ground, is well built, has a large harbour, and a daily service of steam-packets to New York. It has extensive cotton, woollen, and calico-printing factories, iron-works, &c., and there are large quarries in the neighbourhood. Pop. in 1890, 71,398; in 1900, 104,863.

FALMOUTH, a seaport town and parliamentary and municipal borough of England, in the county of Cornwall, 250 miles W.W. of London. There is a good harbour here, defended by Pendennis Castle on the west, and the castle of St. Mawes on the east, and with a fine and spacious roadstead. The town consists of one street, stretching more than a mile along the beach, with beautiful terraces and villas on the heights behind and along the sea-front. Falmouth was at one time an important packet station, and is still an important port of call for vessels. The principal industries are ship-building and engineering, and there is also a good trade in furnishing supplies to shipping. Falmouth and Penryn together return one member to Parliament. Pop. (1891), 4737; (1901), as extended in 1892, 11,773; cf. *parl. bor.* (1891), 17,454; (1901), 16,296.

FALSE, in music, an epithet applied by theorists to certain chords, called *false*, because they do not contain all the intervals appertaining to those chords in their perfect state: as a fifth, consisting of only two tonic and two semitonic degrees, is denominated a *false fifth*. Those intonations of the voice which do not truly express the intended intervals are also called *false*, as well as all ill-adjusted combinations; and those strings, pipes, and other sonorous bodies, which, from the defective disposition of their parts, cannot be accurately tuned. Certain *dissonances*, or *consonances*, are likewise termed *false*, in contradistinction to the full or final *close*.

FALSE IMPRISONMENT (English law). To constitute the injury of false imprisonment two points are necessary: the detention of the person, and the unlawfulness of such detention. Every confinement of the person is imprisonment, whether in a common prison or a private house, or even by forcibly detaining one in the streets or highways. The law punishes false imprisonment as a crime, besides giving reparation to the party injured, through an action of trespass.

FALSE PERSONATION (English law). All forms of false personation, for the purpose of obtaining the property of others, were formerly misdemeanours punishable by fine or imprisonment, but are now made penal by express statute. The penalties for personation are frequently heavy. Thus to personate the owner of any share, stock, or annuity, &c., is felony, and liable to penal servitude for life, or to a modified term of penal servitude or imprisonment. The false personation of voters at an election is a misdemeanour punishable with imprisonment and hard labour, for a term not exceeding two years.

FALSE PRETENCES (English law). Obtaining property by false pretences is a misdemeanour at common law, and punishable by fine or imprisonment. Some kinds of it are now by statute punishable by penal servitude, not exceeding five years.

FALSE PROPHECIES (English law), with intent to disturb the peace, are misdemeanours at common law. By 5 Elizabeth, cap. xv., now repealed, a second offence was punishable with forfeiture of goods and imprisonment for life.

FALSE SIGNALS (English law). To exhibit a false signal, with a view to bring a ship into danger, is a felony punishable with penal servitude for life.

FALSETTO (Ital.) applies in singing to the notes above the natural compass of the voice. It is also called a head or throat voice, in contradistinction to the chest voice, which is the natural one. The falsetto voice is produced by tightening the ligaments of the glottis. Its thin, constrained effect is most noticeable in men with deep-set voices, the register of which it frequently extends more than an octave above the pure chest voice.

FALSE VERDICT (English law). A jury cannot now be prosecuted for giving a false verdict, but the verdict may be set aside on appeal and a new trial granted.

FALSE WEIGHTS AND MEASURES. By various British statutes standards are provided for weights and for measures of capacity or dimension, and all contracts of sale, &c., are referred to such standards unless there is a special agreement to the contrary. Uniformity of weights and measures is evidently founded on justice, and is indispensable as a means of facilitating the despatch of business. It was required by a statute of Henry III. in 1225, and a long train of measures has since been passed to regulate it. Examiners of weights and measures were appointed by act of George III. in 1795. The use of weights and measures, and the penalties for the use of false weights and measures, are now regulated by the Weights and Measures Act, 1878, 41 and 42 Vict. cap. xlix., which repeals twenty-two prior enactments on the subject, and is in substance a codification of the law applicable to weights and measures.

FALSIFYING RECORDS is punishable as an offence against public justice by 24 and 25 Vict. cap. xxviii. (1861), for the consolidation of penal laws.

FALSTER, an island belonging to Denmark, situated at the entrance of the Baltic, south of Seeland, and between the islands of Læsland and Moen, from which it is separated only by narrow straits; it is about 60 miles in circumference, elevated, but flat,

well watered and wooded, productive in grain, pulses, potatoes, and, above all, fruit, so that it is styled the *orchard of Denmark*. The principal towns are Nyekiøping and Stubbekiøping. Pop. in 1890, 32,640; in 1901, 34,422.

FALUN, or **FÄLUN**, a town of Sweden, capital of the län of Kopparberg, on the Falun, near its mouth in Lake Runn, 50 miles west of Gefle. The principal buildings comprise the Kristina-Kyrka, a church of the seventeenth century; the town-house; the gymnasium; and a museum. It is famous for its copper mines, which have been worked for several centuries. Pop. (1890), 8010; (1900), 9606.

FAMA, the goddess of report or rumour. She was the youngest daughter of the Earth, who revenged herself on the gods for the destruction of her sons, the giants, by bringing forth this mischievous goddess. Loquacious Fame divulges the deeds of the gods, and spreads reports among them. She is represented with wings; with as many ears, eyes, and tongues as feathers. She is said to fly through the world in the night, and in the daytime to look down from high towers and roofs; small at first, and gradually increasing in size in her progress, &c.—These are the poetical fictions of Virgil and Ovid.

FAMA CLAMOSIA, in the ecclesiastical law of Scotland, is a public report imputing immoral conduct to a clergyman, licentiate, or office-bearer of the church. If a fama clamosa arise against a clergyman a church court is only bound to take notice of it, if no direct accusation is made, when it becomes so notorious that it cannot be overlooked without apparent negligence or laxity of discipline. When this is the case the presbytery, or court of first instance, first inquires into the occasion of the fama, and if it appears that there is sufficient ground for instituting a process (libel), and no particular party comes forward to do so, they libel him themselves.

FAMAGOSTA (ancient *Arsinoe*), a ruined seaport of Cyprus, on the east coast, built on a rock. It is about 2 miles in circumference, and was once strongly fortified, but is now in decay. It was a place of considerable importance during the Crusades. After being taken by the Crusaders, under Richard I., it belonged successively to the Cyprian Kingdom of Guy de Lusignan, to the Genoese, and to the Venetians. It was captured by the Turks after a protracted siege in 1571. Under British rule it has again begun to revive somewhat. Pop. (1891), 2251.

FAMILIAR SPIRITS, demons or evil spirits supposed to be continually within call and at the service of their masters, sometimes under an assumed shape, sometimes attached to a magical ring, or the like; sometimes compelled by magic skill, and sometimes doing voluntary service. We find traces of this belief in all ages and countries, under various forms. In eastern stories nothing is more common than the mention of magic gems, rings, &c., to which are attached genii, sometimes good, sometimes bad. The fawn of Sertorius is a well-known instance in Roman history. But in modern Christian Europe the notion of familiar has been restricted to evil spirits. Cornelius Agrippa is said, by Jovius, to have been always accompanied by a devil in the shape of a black dog, which, on the death of his master, plunged into the Saône, and was never seen afterwards. Paracelsus was believed to carry about a familiar in the hilt of his sword. The story of the witch of Endor, contained in the 28th chapter of 1 Samuel, has been the source of a wide-spread belief in the communion of certain persons, particularly women of peculiar habits, with familiar spirits in our own country down to modern times. Allusion is made to this belief in numerous plays of Shakespeare,

and until the reign of George II. women suspected of intercourse with familiars were liable to be prosecuted for witchcraft.

FAMILY COMPACT, the name given to a compact organised by the Duke de Choiseul, first minister of Louis XV., between the various members of the Bourbon family, then sovereigns of France, Spain, the Two Sicilies, Parma, and Piacenza, mutually to guarantee each other's possessions. It was signed 15th August, 1761. It entailed on Spain a war with England, then at war with France. Other similar agreements, especially that of 1783 between the kings of France and Spain, bear the same name.

FAN. See **FANA**.

FANARIOTS, or **PHANARIOTS**, the inhabitants of the Greek quarter, or Phanar, in Constantinople, particularly the noble Greek families resident there since the times of the Byzantine emperors. The dragoman or interpreter of the Porte used to be taken from their number. From 1731 to 1822 the Porte also chose from their number the hospodars of Moldavia and Wallachia. Till 1869 the office of dragoman had been filled by Jews and renegades. In that year Mohammed IV. for the first time employed a Greek, Panayotaki, as grand interpreter. The power of the influential Fanariots soon increased so much that, after the cruel death of the last native hospodar of Wallachia, Bassaraba Brancareo, in 1731, a Greek, Mavrocordatos, was appointed to succeed him. They have now no political influence.

FANATICISM, a term applied more particularly to extravagance manifested in religious matters, by those who allow themselves to be hurried away by their fancy and feelings, to the adoption not only of wild enthusiastic views, but also of inordinate and not unfrequently persecuting measures. By an extension of the term it is also sometimes applied to other forms of extravagance, which in their outward manifestation are accompanied with impetuosity and violence. Thus, we speak of political fanaticism, which, in affairs of state, displays itself in a violent and intolerant partisanship. Not unfrequently both kinds of fanaticism are found combined, and to this combination most of the religious wars which have desolated kingdoms are to be ascribed.

FANCY, a word which in its general acceptation refers both to the forms of the imagination, and to the mental faculty which produces them. Fancy is not, however, in this double sense, quite co-extensive with imagination. It is used frequently for the lighter or more fantastic forms of the imagination, and for the active play of that faculty which produces them. Sometimes it approaches to the grotesque, and is closely allied to humour. At other times it is more delicate, and represents the lighter and more aerial forms of imagination. Sometimes, again, it is nearly synonymous with imagination in its full extent. This vagueness and flexibility of meaning has made the word a favourite one with poets and imaginative writers. See **IMAGINATION**.

FANDANGO, an old Spanish dance, which originated most probably in Andalusia. It is generally accompanied by the guitar, and the performers use castanets. Foreigners are often astonished and offended when they see this dance for the first time; however, few fail to become reconciled to it. It proceeds gradually from a slow and uniform to the most lively, but never violent, motion. The story goes that the court of Rome, scandalized that a country renowned for its faith should not have long proscribed such a profane dance, resolved to pronounce a formal condemnation of it. A commission was appointed to examine into the matter, and the fandango was prosecuted *in forma*. Sentence of condemnation was about to be pronounced,

when one of the judges observed that a criminal could not be condemned without being heard. A couple of Spaniards were brought before the assembly, and, to the sound of proper instruments, displayed all the graces of the fandango. The judges soon lost their severity; their austere countenances began to relax; they rose, and their arms and legs found their former suppleness. The hall of the grave fathers was thus changed into a dancing-room, and the fandango was acquitted! The fandango is seldom danced but at the theatre, and in the parties of the lower classes. It is performed by two persons only, who never touch so much as each other's hands; but their reciprocal allurements, retreats, approaches, and varied movements, by turns pursuing and pursued, their looks, attitudes, and whole expression, are grossly indicative of voluptuousness.

FANFARE (Frenoh), a short, lively, loud, and warlike piece of music, composed for trumpets and kettle-drums. Also a small, lively piece performed on hunting-horns, in the chase.

FANO (ancient *Fanum Fortunæ*), a seaport of Italy, in a rich and fertile plain on the Adriatic, province of Pesaro e Urbino, 29 miles north-west of Ancona. It is a handsome, well-built town, surrounded by walls, which it owes to the Emperor Augustus, and containing among its buildings a triumphal arch of white marble erected to his honour. Among the chief buildings are a cathedral with valuable paintings, several other interesting churches with paintings, a public library, and a fine theatre. Silk-weaving and fishing are important industries of the town, which is also resorted to for sea-bathing. The harbour is unimportant. Pop. (with suburbs), 20,000.

FANON, an ecclesiastical term of various applications. It was used to denote the cloth in which the deacon in the ancient or early mediæval church received the oblations, and is now generally applied to a striped, oblong piece of silk gauze worn on the head and shoulders by the pope in celebrating mass pontifically.

FAN PALM, a name given to all those species of palms which have fan-shaped leaves, but applied more particularly to two or three of the best-known. Among these are *Chamærops humilis*, the only kind of palm growing wild in Europe (see **CHAMÆROPS**); various species of *Sabal*, including the palmetto (which see); the Chinese *Trachycarpus fortunei*; and the Talipot Palm or *Corypha umbraculifera*. (See **TALIPUT PALM**.) It is also applied to the Mauritia or Wine Palm (*Mauritia vinifera*), a tree which grows in great abundance on the banks of the Orinoco river in South America. The whole country in which it is found is subject to inundations, and the fan-like branches of these trees look like a forest rising out of the expanse of waters. The navigator who passes along the delta of the Orinoco is surprised to see the tops of these trees lighted up with fires. They are kindled by the Guaraona, a people who have remained for ages in these marshes, secured from the floods by living in the palm-trees. In the branches they suspend mats, which they fill with clay; and on this damp earth they kindle the fires which are necessary for their comfort. This palm offers to its rude race, as well as to other tribes who inhabit the Gulf of Darien and the watery lands north and west of the mouths of the Amazon, a safe habitation amidst the inundations to which those countries are subject. But it affords them also in its fruit, its farinaceous bark, its pith (yielding a substance called by the natives *ipuruma*, and closely resembling mango), its sap (abounding with sugar), and its fibrous stalks, pleasant food to eat, and wine to drink, and strong thread to make cordage and hammocks. 'It is curious to behold,' says Humboldt, 'in the lowest stage of

civilization, the existence of a whole race depending upon a single species of palm, in a similar degree with those insects which subsist upon one species of flower.' The genus *Mauritia* was named by the younger Linnaeus in honour of Prince Maurice of Nassau. See plate at PALMS.

FANS. The Greeks were well acquainted with fans as an article of luxury. From a passage in the *Orestes* of Euripides it appears that the Grecian fans were introduced from the East, that they were of a circular form, and were mounted plumes of feathers. Dionysius of Halicarnassus describes the courtiers of Aristodemus at Cumæ as attended by females bearing parasols and fans (*skiadra kai ripidas*). Plautus mentions *labelliferas* as forming part of a Roman fine lady's retinue, and Suetonius describes Augustus as lying, during the heat of summer, in the shade, and fanned by an attendant (*ventilante aliquo*). In the middle ages fans were used in the churches, sometimes of great size, and richly decorated, to chase away the flies from the holy elements of the eucharist. They are said to have been introduced into England from Italy in the reign of Henry VIII.; and in the reign of Elizabeth they were framed of very costly materials, the body of ostrich feathers, the handle of gold, silver, or ivory, of curious workmanship. Fans in the form of machines are used in agriculture for winnowing corn; in metallurgy and other branches of manufacture for ventilating and stimulating the combustion of fires; for the ventilation of mines; and for various other manufacturing purposes.

FANSHAW, SIR RICHARD, an eminent diplomatist, poet, and translator, born at Ware, Hertfordshire, in 1608. Having studied at Cambridge he made the grand tour, and on his return entered himself of the Inner Temple. He was despatched in 1635 by Charles I. in the capacity of secretary to the embassy at Madrid. On the breaking out of the civil wars in 1641 he engaged actively in the royal cause, and was appointed secretary at war to the Prince of Wales in 1644, and treasurer to the navy under Prince Rupert in 1648. He was made a baronet in 1650, and sent on an embassy to Spain, and afterwards appointed secretary of state for Scotland. He was taken prisoner at the battle of Worcester in 1651. A severe illness shortened the term of his imprisonment, and he was permitted to go at large on bail. On the death of Cromwell he passed over the Channel in 1659 to the king at Breda, by whom he was made his Latin secretary and knighted. In 1661 and 1662-63 he was employed on two several missions to the court of Lisbon, in the former of which he negotiated the marriage of Charles II. with Princess Catherine, and on his return in 1663 he was advanced to a seat in the privy-council. In 1664 he was sent ambassador to Madrid, and negotiated a peace between England, Spain, and Portugal. Falling suddenly ill of a fever he died at Madrid, June 16, 1666. His poetical abilities were above mediocrity, as is evinced by his translations of the *Lusiad* of Camoens, the *Pastor Fido* of Guarini, the *Odes* of Horace, and the fourth book of the *Æneid* into English verse, and Fletcher's *Faithful Shepherdess* into Latin. Among his posthumous writings, printed in 1701, is his correspondence during his embassies to the courts of Lisbon and Madrid, and some occasional poems, with a life of the author prefixed.

FANTASIA (Italian), in music, the name given to a species of composition, supposed to be struck off in the heat of imagination, and in which the composer is allowed to give free range to his ideas, and to disregard those restrictions by which other productions are confined. Some writers limit the application of this term to certain extemporaneous flights of fancy, and say that the moment they are written or repeated

they cease to be *fantasias*. This, they add, forms the only distinction between the *fantasia* and the *capriccio*. The *capriccio*, though wild, is the result of premeditation, committed to paper, and becomes permanent; but the *fantasia* is an impromptu, transitive and evanescent, exists but while it is being executed, and when finished is no more.

FANTEE, a country of Africa, on the Gold Coast, which extends about 90 miles along the shore of the Atlantic, and 70 inland; lat. 5° 30' N.; lon. 1° W. The inhabitants, called *Fantees*, were at one time the most numerous and powerful people situated immediately on the Gold Coast; but their power was almost entirely broken after 1811 by invasions of the Ashantees. Their country now forms a district of the British Gold Coast Colony. The soil is fertile, producing fruits, maize, and palm-wine. The custom of making small sacrifices on the upper part of the cheek-bones and the back of the neck prevails among the Fantees. Their government is aristocratic. Their head chief is supreme judge or governor, and is attended by a council of old men. Each town has a chief. The country of the Fantees is populous and prosperous, owing to the protection afforded by the British settlements, and particularly by Cape Coast Castle. In 1873 they were again attacked by the Ashantees, who also threatened the British settlements, and compelled the government of Great Britain to send out an expedition under Sir Garnet (now Lord) Wolseley to suppress them.

FARADAY, MICHAEL, one of the greatest of English chemists and natural philosophers, was born in humble circumstances at Newington Butts, near London, on the 22d September, 1791. Early in life he was apprenticed to a bookbinder in London, and in this position he manifested his strong taste for study by eagerly reading the books which he bound. At the same time he occupied himself in his leisure hours with the construction of electrical and other machines, with scientific experiments, and other similar pursuits. By this means he attracted the notice of a friend of his master's, who took him with him to Sir Humphry Davy's lectures, which Faraday continued regularly to attend. He now became more and more anxious to quit trade, which was in every way distasteful to him, and to devote himself to the service of science in however mean a capacity. With this end he sent his notes of the lectures he had heard, which he had taken with great care, to Sir Humphry Davy, informing him at the same time of his present position and his desire to change it for a more congenial one. Struck by the great ability which these notes displayed, Davy promised to do what he could to carry out his views, and a few weeks after, early in 1813, he appointed him his assistant at the Royal Institution. The period from October, 1813, to April, 1815, was spent by Faraday in travelling over the Continent as scientific assistant and secretary to Sir Humphry, and after his return he remained in close application to his favourite studies, and in uninterrupted connection with the scientific institution he had first joined. In 1829 he was appointed chemical lecturer at the Royal Military Academy at Woolwich—an office which he retained till 1842; and in 1833, when the chair of chemistry at the Royal Institution was founded, he was appointed the first professor. It was while he held this office that the most of his great electrical discoveries were made, and communicated to the *Philosophical Transactions*. Already in 1821 he had made the important observation referring to the connection between electricity and magnetism, which was the first of a series of discoveries on that subject that in 1823 procured him the honour of being elected corresponding member of the French Academy of Sciences, and in 1825 of being admitted fellow of the

Royal Society. His first communication to the Philosophical Transactions was made in 1831. It was followed up by a large number of others, extending over a great many years; and these were afterwards published separately in three volumes, the first in 1839, the second in 1844, and the third in 1855. In 1832 he received the honorary degree of D.C.L. from Oxford; in 1842 he was elected honorary member of the Academy at Berlin; in 1844 he was made one of the eight foreign associates of the Academy of Sciences of Paris; and various other honours, too numerous to mention, were bestowed on him, both at home and abroad. In 1835 he received a pension of £300 a year from Lord Melbourne, and in 1858 Queen Victoria granted him a residence at Hampton Court, where he lived during the summer in the remaining years of his life, and where he died, August 25, 1867. The following may be mentioned as a few of his most important discoveries:—Induced electricity; the identity of electricity from different sources; the relation of the electric and magnetic forces; electrostatic induction; diamagnetism and the magnetic condition of all matter; while the electric telegraph and the aniline dyes are justly regarded as indirect results of his philosophical experiments. As an experimentalist Faraday was considered the very first of his time; and he was as remarkable for the wonderful care and delicacy with which he performed his experiments as for the thorough knowledge of his subject, and the far-reaching thought which he displayed in conceiving them. He was equally distinguished as a lecturer, and as such captivated the young and the old. His lectures have been published at different times. First appeared his Lectures on Light and Ventilation (London, 1843); then his Lectures on the Non-metallic Elements (London, 1853); and Lectures on Various Forces of Matter (London, 1862). See the Life and Letters by Dr. Benze Jones (2 vols., 1870); Faraday as a Discoverer, by John Tyndall (1868); his Experimental Researches in Electricity (3 vols., 1839-55); Researches in Chemistry and Physics (1859).

FARCE, a dramatic piece of broadly comic character. It is grotesque and extravagant rather than artistically humorous, but is often genuinely mirthful. Farces are of great antiquity, but the modern farce began to assume something of its characteristic form in the fifteenth century, and during much of its history it has been disfigured by license and indecency. Molière's plays are mostly of the nature of farces. Some nations have a standing character who regularly appears in their farces, and is always, therefore, very characteristic; such as the Italian *arlecchino*, *scaramuccio* (harelequin, scaramouch), &c.; the German *Hanswurst* ('jack-pudding'), &c.

FARCY, a disease to which horses are liable, intimately connected with glanders, the two diseases generally running into each other. It is supposed to be a disease of the absorbents of the skin, and its first indication is generally the appearance of little tumours called 'farcy buds' on the face, neck, or inside of the thigh. By order of the privy council the provisions of the Contagious Diseases (Animals) Acts may be made to apply to animals affected with farcy. See **GLANDERS**.

FAREHAM, a market town of England, in Hampshire, at the head of a short arm of the harbour, and 9 miles N.W. of Portsmouth. The chief buildings include the town-hall, Foresters' Hall, market-hall, &c., and near the town is the county lunatic asylum. There are shipyards, potteries, brickworks, tanneries, &c. The town gives name to one of the five parliamentary divisions of Hants. Pop. of town (1891), 7934; (1901), 8246.

FARÉL, GUILLAUME, one of the earliest and most

active of the Swiss reformers, was born in 1489, near Gap, in Dauphiny. At an early period the study of the Bible led him to reject many of the chief doctrines of the Church of Rome. At Basel, in 1524, he publicly sustained several theses in support of Protestantism, and he afterwards preached in Straaburg, Montbéliard, and elsewhere. In 1530 he secured the public adoption of the reformed doctrines in Neuchâtel. Geneva, however, became the principal scene of his labours. Here, in the religious conferences of 1534 and 1535, he defended his beliefs so successfully that the reformed parishes not only obtained permission to hold public religious services, but the council formally embraced the Reformation. In concert with Calvin he took an active part in 1536 at the disputation in Lausanne, when the Reformation was embraced. In consequence of a quarrel, arising out of an attempt to enforce a stricter moral discipline, he was banished from Geneva in 1538, and ultimately took up his residence in Neuchâtel, where he died on Sept. 13th, 1565. See the Life by Bevan (London, 1893).

FARGO, a town of the United States, capital of Cass county, North Dakota, situated at the head of the navigation of the Red River of the North, and about 250 miles W. of Duluth by rail. From being a small village it has rapidly grown into an important centre of trade, especially in wheat and agricultural machinery. There are numerous banks and churches, and a Congregational college. Pop. (1890), 5664; now over 10,000.

FARGUS, FRIDERICK JOHN, novelist, better known by his pseudonym of Hugh Conway, was born at Bristol on Dec. 26th, 1847. In 1860 he went on board a school frigate as a student, but a few years later he was induced to give up his intention of becoming a seaman. After a short period as an accountant's clerk he succeeded in 1868 to his father's auctioneering business. In 1879 he issued a volume entitled *A Life's Idylls and other Poems*, and about that time he contributed to various periodicals. His best-known novel, *Called Back*, appeared in 1883 and attained a very large sale. It was translated into all the chief languages of Europe, and was also dramatized. In 1885 he went to the Riviera, where, on May 15th of that year, he died. Of his other works we may mention *A Cardinal Sin* (1883); *Dark Days* (1884); *Bound Together* (1884), a collection of short stories; *A Family Affair* (1885); and *Living or Dead* (1886).

FARIA Y SOUSA, MANUEL, historian and lyric poet, was born in 1590, near Pombelo, in Portugal, of an ancient and illustrious family. In his ninth year he was sent to the University at Braga, and in his fourteenth he entered the service of the Bishop of Oporto. A passion for a beautiful girl first awakened his poetical genius. He celebrated her under the name of Albania in his sonnets, married her in 1613, and went to Madrid. But he did not succeed there, and returned to Portugal. He also visited Rome, and gained the notice of Urban VIII. He returned again to Madrid, and died there on June 3rd, 1646. Among his writings are—*Discursos Morales y Politicos*; *Epítome de las Historias Portuguesas*; and we have also a collection of his poems called *Fountain of Aganippe* (*Fuente de Aganipe*, *Rimas varias*, 1644-46). His style was pure and strong, and his descriptions full of vigour.

FARINA is the meal or flour of wheat or other starchy grains, hence called *farinaceous*. The *farina* or starch of the common potato contains more water than other starches, and is used in sizing cotton goods and in the manufacture of British gum.

FARINELLI, one of the greatest singers of the eighteenth century, was born at Naples in 1705.

His true name was Carlo Broschi. He was made a eunuch in order to develop his vocal powers, and he afterwards studied under Porpora. He visited Rome, Vienna, Paris, and London with the greatest success, and went to Spain, where he found King Philip V. plunged in a profound melancholy. He succeeded in rousing him from it by the powers of his voice, and became his prime favourite and political adviser. But the penalty of his advancement, as he tells in his correspondence with Burney, was that for ten years he had to sing every night to his royal master the same four airs. He continued in favour with Philip's successors Ferdinand VI. and Charles III., and remained in Spain altogether from 1737 to 1761. On his return to Italy he found himself almost forgotten, but continued to exercise a splendid hospitality in his country house, near Bologna. He died on Sept. 15th, 1782.

FARINGTON, or **GREAT FARINGTON**, a market town of England, in the county of Berks, on a branch of the Great Western Railway, 16 miles south-west of Oxford, with a handsome well-restored parish church, an old town-hall, &c. Pop. (1891), 3133.

FARM. The size of farms and their tenure differs very much in different countries. On the continent of Europe, where peasant proprietaries, cultivation by metayers, and mixed tenures prevail, farms are generally small. In England, where the land is in the hands of a comparatively small number of proprietors, and is let out to farmers who pay a fixed rent and make a trade of cultivating their holdings, they are in many localities large. The short tenure of land usually prevailing in England and Ireland has given rise to many disputes about compensation for improvements effected by tenants, &c. The system in Scotland of giving a lease for nineteen years is by many considered preferable, but the recent depression in agriculture has caused a considerable change in the Scottish practice. The buildings necessary on a farm of course depend on its size and the system of cultivation. With the farms common in Great Britain, a farm-house or residence for the farmer, cottages for the servants, buildings for cattle, dairies, barns, &c., are all considered essential. The size of these buildings depends a good deal on the method of management, the number of cattle reared on the premises, and the amount of produce kept for feeding them; the distance of the market, and the processes the crops undergo before being carried to it. Much greater attention is now paid to all these points than formerly, as the economical management of a farm greatly depends on them. The importance, in particular, of clean and well-aired sheds for cattle is now universally recognized. Covered farm-yards, containing all the offices under one roof, are becoming common, and offer many conveniences besides economy in erection. The accommodation for the labourers on the farm has latterly been greatly improved. For a farm of £250 rent the necessary buildings would probably cost £1200. (See **AGRICULTURE**, **DAIRY**, **BUTTER**, **CHEESE**, &c.)

FARMER, **RICHARD**, master of Emmanuel College, Cambridge, was born at Lalester on Aug. 28th, 1735. He received his earlier education in the free grammar-school of his native town, and in 1753 entered Emmanuel College, from which he graduated four years later as a senior optime. He became classical tutor in his college in 1760, and about the same time he received the curacy of Swavesey. In 1767 he published his *Essay on the Learning of Shakspeare*, which passed through several subsequent editions. In it he showed that Shakspeare's knowledge of classical subjects was entirely obtained

through translations, which he often followed very closely. He was appointed master of Emmanuel College in 1775, and on two subsequent occasions he was vice-chancellor of the university. In 1778 he became principal librarian of the university, and two years later he was collated to a prebendal stall at Lichfield. He was a prebendary of Canterbury from 1782 till 1788, when he was appointed to a residentiary prebend in St. Paul's, London. He died at Cambridge on Sept. 8th, 1797. Dr. Farmer was a friend and correspondent of Dr. Johnson, to whom he rendered some assistance in connection with his *Lives of the Poets*.

FARMERS-GENERAL (French, *Fermiers généraux*), private contractors, to whom the French government, before the great revolution, let out the collection of various branches of the revenue, poll-tax, duties on salt and tobacco, customs, &c. These contractors made enormous profits on the farming of the public revenues, the indignation excited by which was one of the stimulating causes of the French revolution. The system of farming the revenues goes back as far as the thirteenth century, but the system of general farming was not regularly constituted till 1681. Philippe le Bel frequently contracted with Jews and Lombards for the collection of the taxes. A revenue collected in this way not only imposed a much heavier burden on the people, but the merciless rigour of irresponsible and uncontrolled exactors subjected them to hardships and indignities to which they could not submit without degradation; summary executions, violence, and imprisonment left a train of injuries to rankle in the minds of a sensitive people, sufficient to overturn the firmest government that ever existed. During the prevalence of this abuse, however, the farmers-general became wealthy and powerful enough to exercise a great influence in the state, and thus their victims had small hope of redress except in revolution, and frequent popular revolts were the consequence. In the reign of Louis XIII. 120 of these mercenary oppressors have been reckoned to exist in France, and as their privileges were commonly sublet, with, of course, a new set of profits to the sub-agents, an army of locusts could hardly have been more destructive to the agriculture of Egypt than they were to the industry of France. Henry IV.'s great minister Sully cancelled many of their contracts, but the system was too deep-rooted to be got rid of by a single financier. In 1790 the system was suppressed. Many of the farmers-general, among whom was the celebrated chemist Lavoisier, fell victims to the popular indignation, and perished on the scaffold.

FARMING. See **AGRICULTURE**.

FARNE, or **FERNE ISLANDS**, or the **STAPLES**, a group of English islets in the German Ocean, off the north coast of Northumberland, 2 miles E. by S. of Bamborough Castle, and separated from the mainland by a channel of about 1½ mile. The largest island is associated with the work of St. Outhbert, and has several interesting relics and ruins, an ancient chapel, and a peel tower. They have been the scene of several disastrous shipwrecks, one of which, that of the *Forfarshire* steamer, in 1838, occasioned the signal display of heroism by Grace Darling, daughter of the keeper of the outer Farne light. Another steamer, the *Pegasus*, going from Leth to Hull, was lost here in 1843, when sixty individuals perished. There are three lighthouses. Pop. 15.

FARNESE, an illustrious family of Italy, whose descent may be traced from about the middle of the thirteenth century. One of its members became pope as Paul III. in 1534. (See **PAUL**).—**OTTAVIO FARNESE**, the son and successor of Pietro, who had become duke of Parma and Piacenza, was at Perugia

with Paul III., his grandfather, at the time of his father's assassination in 1547. Parma declared itself in favour of Ottavio, who took possession of it with the Papal troops, but found himself, singly, too weak to attempt the capture of Piacenza. Julius III., the successor of his grandfather, out of gratitude to the family of Farnese restored to him the duchy of Parma in 1550, and appointed him gonfalonier of the church. He died in 1586.

ALESSANDRO FARNESI, elder son of Ottavio, general of Philip II. in Flanders, and third duke of Parma and Piacenza, born in 1547, succeeded him. He served his first campaign under Don John of Austria, and distinguished himself in the battle of Lepanto in 1571. In 1577 Philip II. ordered him to lead back the Spanish troops, which Don John had been obliged to dismiss from Flanders; and Don John dying that year, Alessandro was made governor. He recovered Maestricht and several other cities, and succeeded in reconciling the Catholic part of the insurgents to the Spanish government. The Protestants, however, formed the Union of Utrecht (1579), and called in the Duke of Anjou, a brother of Henry III. of France, to defend them. He appeared at the head of an army of 25,000 men; but Alessandro was constantly successful. Fortunately for the Dutch, a civil war broke out in France. Alessandro entered France, and compelled Henry IV. to raise the siege of Paris (1590). During his absence Maurice of Nassau had obtained many successes in the Netherlands, yet, with a mutinous and unpaid army, Alessandro kept in check both Maurice and Henry IV., and forced the latter in 1592 to raise the siege of Rouen. On his return from that expedition he received a wound before Caudebec, and died at Arras on Dec. 3rd, 1592.

RANUZIO I., his eldest son, born in 1569, succeeded him as duke. He inherited none of the heroic qualities of his father, but was gloomy, severe, suspicious, and avaricious. Observing the discontent of the nobles with his administration, he accused them of having entered into a conspiracy against him, and, after having subjected the chiefs to a secret trial, beheaded them, and confiscated their estates (May 19, 1612). He imprisoned his natural son Ottavio, and left him to perish in cruel confinement. Ranuzio died in 1622.

FARNHAM, a market town of England, in the county of Surrey, on the Wey, 35 miles s.w. of London. It is a well-built town, consisting of four principal streets which meet in a central market-place, and containing a handsome and spacious Gothic parish church, a market-house and corn-exchange, assembly-rooms, grammar-school, a science and art school, &c. North of the town is Farnham Castle, the residence of the bishops of Winchester, originally built by Henry de Blois, brother of King Stephen. The staple trade is in hops. William Cobbett was born here, and the churchyard contains his tomb. Pop. in 1881, 4530; in 1891, 5546; in 1901, 6124.

FARNWORTH, a market town of England, in Lancashire, 8 miles to the south-east of Bolton. It has a grammar-school founded in 1715, and among its industrial establishments are paper-mills, iron-foundries, cotton-mills, collieries, brick-works, &c. The Bolton water-works are at Farnworth. Pop. (1891), 22,758; (1901), 25,927.

FARO, a seaport on the south coast of Portugal, capital of the district of Faro, on a bay protected by islands. There is an old castle surrounded by Moorish fortifications. The town is well built, and has a fine square, a cathedral, a theological seminary, a military college, &c. The harbour is not very commodious, though the roadstead is good; and there is a considerable trade, chiefly in oranges, dried fruits,

shumac, cork, fish, and articles made of *esparto*. Pop. (1890), 8844; (1900), 11,885.

FARO, or PHARO, a game of hazard at cards played chiefly in gambling establishments.

FAROE ISLANDS (or FARÖR, that is 'Sheep Islands'), a group of islands in the Northern Ocean, lying between 61° 20' and 62° 25' N. latitude, about 280 miles s.e. of Iceland, and about 190 n.w. of the Shetland Islands. They have an area of 514 square miles, belong to Denmark, and consist of about twenty islands, of which seventeen are inhabited. The largest islands are Strömö (144 sq. miles), Osterö, Sandö, Sudero, and Vaagö. The islands generally present steep and lofty precipices to the sea; the surface rises towards the interior, Slattaratind in Osterö being 2894 feet high, while a pinnacle called the Witch's Finger is said to be 3000 feet. The climate is milder than the latitude might indicate, but the weather is very variable. Sheep and horses can winter in the open air. The soil is generally thin; barley is the only cereal that comes to maturity; turnips and potatoes thrive well. There are no trees, but plenty of excellent turf, and coal also. The wealth of the inhabitants is chiefly derived from fishing and the feeding of sheep. The fowls of sea-fowl form an important article of trade. Some horses and cattle are kept; the former are small, but strong and hardy. Thorshavn, in Strömö, is the seat of government, and the only town. These islands have belonged to Denmark since 1880. The inhabitants are Norse, and speak a Norse dialect in which there are a number of old ballads extant; the official language is Danish. The islands are easily reached by steamer. Pop. in 1890, 12,955; in 1901, 15,230.

FARQUHAR, GEORGE, a comic writer of eminence, was born at Londonderry in 1678. In 1694 he was sent as a sizar to Trinity College, Dublin, but he did not study long here. His partiality for the drama induced him to make his appearance on the stage at Dublin; but he soon relinquished this profession. About 1698-98 he went to London, where he commenced writing for the stage. His first production was *Love and a Bottle*, performed with great success in 1699. About this time he attracted the favour of Lord Orrery, who procured him a lieutenancy in his own regiment. In 1700 he added to his reputation by his comedy of *The Constant Couple*, in which, under the character of Sir Harry Wildair, he exhibited a lively picture of the foppish fine gentleman of the end of the seventeenth century. In 1701 appeared Sir Harry Wildair, a sequel to the former comedy; and the following year he published a volume of *Miscellanies*. *The Inconstant*, or *the Way to Win Him*, was the next effort of his pen (1703); and it is amongst those which have kept possession of the stage. About 1703 he married a lady who, having fallen in love with him, had represented herself as the heiress of a large fortune, and Farquhar is said to have pardoned the deception, and treated her with kindness. In 1706 appeared *The Recruiting Officer*, one of his most popular plays; and this was succeeded by *The Beaux' Stratagem*, which is reckoned his masterpiece, though finished within the short space of six weeks, while he was labouring under serious indisposition. He died in 1707. It is no mean testimony of the dramatic talents of Farquhar that three of his plays are still favourites with the public. His wit is genuine and spontaneous, and his characters are admirably supported, and drawn from nature. His plots excel in the arrangement of incidents and in unity of action. The liberalism of language and sentiment which his works exhibit cannot be defended; but it was the vice of the age rather than the writer, who was much less culpable in this respect than Dryden or Wycherley.

FARR, WILLIAM, statistician, was born at Kenley, in Shropshire, on Nov. 30, 1807. Brought up by a country gentleman near Shrewsbury, he studied medicine in that town, and afterwards at Paris and London. In 1837 he contributed an important article on vital statistics to Macculloch's *Account of the British Empire*, and in the following year he was appointed compiler of abstracts in the registrar-general's office. In 1879 he resigned because the post of registrar-general, which fell vacant that year, was given to another in preference to himself, and on April 14, 1883, he died. From 1839 he was connected with the Statistical Society, of which he was president in 1871-72. In 1885 there appeared under the editorship of Mr. N. A. Humphreys a collection of Farr's statistical works entitled *Vital Statistics*, comprising six parts treating respectively of population, marriages, births, deaths, life-tables, and miscellaneous matters. The registrar-general's reports between 1839 and 1880 contain much of his most important work.

FARRAGUT, DAVID GLASGOW, distinguished American admiral, was born near Knoxville, Tennessee, on July 5, 1801. He came of a Spanish family, and his father served in the war of independence. He entered the navy as midshipman in 1810, and served in the war of 1812 against Great Britain. In the years 1815-19 he spent much time in southern Europe and northern Africa, and in 1825 he was promoted lieutenant. He cruised in South American waters in 1828-29, and again in 1833-34. He was commissioned commander in 1841, and during the next two years his time was passed mostly off the coasts of South America. In 1848-50 he was employed in the navy-yard at Norfolk, Virginia, and in 1850 he was ordered to Washington to assist in compiling ordnance regulations for the navy. During the four years 1854-58 he was engaged in establishing a navy-yard in the bay of San Francisco, and during the succeeding two years he was stationed in Mexican waters. In 1862 he was placed in command of a fleet of forty-eight vessels of all kinds, with over two hundred guns, and was ordered to capture the Confederate city of New Orleans. The approaches to the city were guarded by two strong forts, above which was stationed a fleet of fifteen vessels, including an iron-clad ram, whilst below the forts two iron chains supported on hulks were stretched across the river. Sharpshooters and fire-rafts were also in readiness to harass an attacking force. After six days' ineffectual shelling of the forts Farragut forced a passage in the night, got all but three of his ships past the forts in spite of a raking fire, destroyed the Confederate fleet, and finally, on April 25, silenced the last batteries of the rebels. The city then surrendered. Later in the same year he went farther up the river, and ran by the batteries of Vicksburg, but finding that nothing could be accomplished he sailed back past the batteries again. On July 16 he was created rear-admiral. In 1863 he assisted in the capture of Port Hudson. His next great exploit was his successful attack in 1864 on the defences of Mobile, which effectually closed that port to blockade-runners. On his return to New York he was publicly presented with fifty thousand dollars. The rank of vice-admiral was specially created for him in Dec. 1864, and in July, 1866, that of admiral was also created for him. In 1867 he was appointed to the European squadron, and spent some years in visiting the chief European countries. He died at Portsmouth, New Hampshire, on Aug. 14, 1870. Washington contains a colossal bronze statue erected by the United States government to Farragut. His *Life* was written by his son Loyall (1879).

FARRANT, RICHARD, one of the earliest English composers of music. Very little is known of his history. He was a gentleman of the chapel royal for some time up till 1564, when he became organist and choir-master of St. George's, Windsor, but in 1569 he was again appointed to the chapel royal. He is supposed to have died about 1580. According to Hullah musical performers of a high class were at this period well distributed over Europe, but were almost entirely dependent on Italy for their music. Farrant is one of those on behalf of whom he claims the existence of an independent English school of music. His music is ecclesiastical, and is distinguished by purity, simplicity, tenderness, and elevation of tone. The anthems *Call to Remembrance*, and *Hide not Thou Thy Face*, composed by him, are well known and highly esteemed by lovers of good music. The exquisitely beautiful anthem, *Lord, for Thy Tender Mercies' Sake*, has been attributed to him, but also to Thomas Tallis and John Hilton.

FARRIERY. See **VETERINARY ART**.

FARRINGTON. See **FARINGDON**.

FARS, or **FARSISTAN** (ancient *Persis*), a province in the south-west of Persia, about 300 miles long by 250 miles broad, and bounded n. by Irak Ajemi and Khorassan, e. by Kerman, s.e. by Laristan, s. and s.w. by the Persian Gulf, and w. by Khuzistan. It is mountainous in the north-west and south-east, flat in the north and north-east, and hilly towards the centre. Notwithstanding large tracts of barren sand, it has several well-cultivated districts, and extensive vales covered with wood and verdure. Its chief rivers are the Bandamir, the Sefid-rud, and the Mand; and it has several salt-lakes, of which the largest is that of Bakhtegan. Agriculture, though less prosperous than in former times, is still better attended to than in most parts of Persia. The most important products are grain, rice, fruit, wine, oil, cotton, tobacco, silk, cochineal, and attar of roses. The manufactures include woollen, silk, and cotton goods; and in these and other articles an active trade is carried on, chiefly with Hindustan. Many ancient ruins are scattered over the province. The capital is Shiraz, and the chief port is Bushire. Pop., of which there are no trust-worthy returns, estimated at 1,700,000.

FARSAN ISLANDS, a group of two larger and several small islands on the east side of the Red Sea, about lat. 16° 30' N.; lon. 42° E. The surface is diversified by hills composed of coral, and occasional valleys and plains. Pearl-fishing is carried on.

FARTHING, the fourth part of a penny, the modern form of the Anglo-Saxon *feorthing*, the fourth part of anything.

FARTHINGALE, or **FARDINGALE**, an article of ladies' attire worn in the days of Queen Elizabeth, and closely resembling the modern crinoline, from which it differed in protruding more at the waist. This fashion prevailed during most of the eighteenth century and part of the nineteenth.

FARUKHABAD, a town of India, in a district of the same name in the North-west Provinces, situated about 2 miles west of the Ganges, 90 miles w.n.w. of Lucknow. It forms a single municipality with Fatehgarh, the civil headquarters of the district, situated 3 miles to the east. It is a well-built town, and many of its streets are shaded by trees. Pop. (1901), with cantonment, 62,878. The district of Farukhabad forms part of the Agra division, and lies mainly along the western bank of the Ganges. Area, 1720 square miles; pop. (1891), 858,687.

FASCES, among the ancient Romans, a bundle of polished rods, in the middle of which was an axe, to express the power of life and death. These fasces, the number of which varied, were carried before the

superior magistrates by the lictors. The lictors were obliged to lower the fasces in the presence of the people, as an acknowledgment of its sovereignty. In the city the axe was laid aside, for the reason of which see CONSUL.

FASCINATION (Latin, *fascinare*, to fascinate or bewitch). For the supposed exercise of fascination by human beings see EVIL EYE.

The power of fascination, which has been attributed to some snakes (vipers, hawks, and cats have been invested with it also), forms a curious chapter in natural history. The existence of this power was at one time universally believed in, and there are not wanting naturalists who still believe in it. The author of the section on Reptilia in the *Standard Natural History* (vol. iii.) speaks thus of the supposed power of fascination: 'The old belief that serpents' charm' is now obsolete, though not extinct. That such a belief should once have been current is not surprising, since birds are often seen to flutter about a marauding snake, but really more from maternal solicitude and friendly sympathy on the part of the birds than from any reptilian power of fascination. The instinctive, and sometimes paralyzing horror which seizes on one when he knows he is the object of some frightful monster's fixed gaze may also be adduced as a cause for a belief so general until within a few years.' Prof. P. M. Duncan thus writes in Cassell's *Natural History* (vol. iv.): 'The fascination said to be exercised by snakes over their prey has formed the subject of many essays, and it is universally credited that under the glance of the serpent, birds, animals, and even man, are motionless, unable to fly from the glistening evil, and, regardless of danger, do not seek to escape, or, fully aware of it, cannot. Snakes in a state of nature and in captivity are different creatures, and the descendants of thousands of generations of animals, all of which have suffered more or less from the serpent's attack, may have hereditary fear of it. But in the snake-room of the Zoological Gardens the captive snakes, and the rats, mice, and birds, unaccustomed to snakes, do not impress one with the truth of the popular belief. Terror, undoubtedly, may exercise a paralyzing influence on the creatures in the way of the snake; and the parental affection of birds for their young, which causes them to flit about their nest, and to be destroyed with their little ones, is usually, but erroneously, taken for fascination on the part of the snake. In fact, an analysis of any instance of fascination shows it to be supposititious.' Some have supposed that the effect produced by fascination might be due to an effluvia emanating from the body of the snake.

FASCINES (military art), bundles of boughs, twigs, &c., 16 feet in length, and usually 1 foot in diameter. The twigs are drawn tightly together by a cord, and bands are passed round them at the distance of 2 feet from each other. The twigs which exceed a given length are cut off or bent back, and the ends are bound into the bundle. Fascines are used in sieges, hydraulic constructions, &c. Very long thin ones are used in constructing batteries, whence they are called *saucissons* or *battery-sausages*. They are sometimes dipped into melted pitch and used for setting fire to the enemy's lodgments, &c.

FASHION (French, *la mode*; German, *mode*) is the term used in England to denote those constant changes in dress and usages which society from time to time adopts and imposes by a sort of arbitrary law upon its members. It is remarked by foreigners that the words *fashion* and *fashionable* in English have a more extended meaning than the corresponding words in other languages. It is said they extend not merely to dress, but to manners, and that these in their minutest details are, as the use of the word

indicates, governed in England by fashion, that is to say, by the caprice of society, a caprice which in its turn is regulated in every grade of what calls itself society by the supposed manners (frequently, it may be, misapprehended) of the upper or aristocratic classes. On this account the words *fashion* and *fashionable* have been imported into the French and German languages, where they bear more or less of an ironical and sarcastic signification.

It is to be feared there is too much truth in this accusation. Whatever may be the case elsewhere, it is certain that English society enthralls itself in a too servile and quasi-superstitious adherence to mere arbitrary forms and usages which have no intrinsic value, and even subjects itself to ridicule by the ludicrous character of the misconceptions to which usages temporarily prevalent may at times be traced. A great man, or a distinguished woman it may be, habitually does something or other for a particular reason. Because the individual is distinguished, the action is imitated without any reason. By-and-by the imitation becomes general, and then it is imposed as a rigid obligation. The unfortunate man or woman who enters society ignorant of this obligation inspires pity and contempt far greater than if he or she were guilty of the most flagrant violation of the decalogue. As soon, however, as this obligation dies out or is superseded by another from the same source, the pity or contempt will be transferred to him who continues to adhere to it. Usages of this kind, of which there is always a plentiful crop ready to spring up like mushrooms, are necessarily evanescent in their nature: thus an individual who is not duly attentive to watch the countenance of society is liable, within a very brief time, to incur its frown for not knowing to do and to omit the same action. Other phases of this thralldom, the ruinous expenses to which it puts innumerable persons in rivaling those above them in means, need not be dwelt on. It were much to be wished that not only in English, but in all other societies, all sensible men should set their faces against a servile adherence to any observance not founded on reason; a liberty the assertion of which would increase all social enjoyments and save much misery occasioned by social restraint as well as by reckless expenditure.

Even in dress, equipage, &c., the matters more strictly belonging to fashion, its rule is, it must be admitted, much too arbitrary. Those who have studied these matters observe that in the changes of dress and other matters subject to fashion there is a sort of cycle or periodical recurrence of usages. Where there is such a cycle there is usually progress. The same thing does not exactly recur, but recurs with modifications which may be considered improvements. Such cycles are observed in art, in literature, and even in human history itself. Progress by cycle may not be the most direct mode of progression, but it seems to be adapted to the constitution of human nature, or, at least, of human society, and may be accepted with resignation if not with enthusiasm. If, therefore, the movement of fashion were steadily cyclic, it might be submitted to with equanimity. But a very little observation will, we think, suffice to show that besides any cyclic movement there is another—very active movement quite distinct from a cyclic one to which the changes of fashion are subject. This movement is not difficult to trace either in its nature or origin—it is a simple see-saw, and it originates with the modistes, who conduct it with great vigour for the purpose of preying upon the purse of society. This movement is much less observable in male than in female attire, but we select the former to illustrate it expressly on this account. We appeal

to the recollection of gentlemen who have never bestowed any special attention on their dealings with their tailors if they cannot recall a constant succession of little changes, a couple of inches more or less in the width of their coat-sleeves, a slight change in the form of a cuff, a collar, or a lapel, without the latest form of which they appear slightly uncomfortable in appearing in society. Why should there be any rigid uniformity in such matters? To this question there can be only one rational answer: For the profit of the tailor.

FASTI (Latin, *fasti*, lawful days, from *fas*, divine law), also known as *fasti sacri* or *fasti calendares*, calendars in ancient Rome containing the succession of the annual games and festivals, the days on which legal business might be transacted, &c. These were at first known only to the *pontifices*, who announced them to the people, and had thus a source of power and profit. In B.C. 204 Cn. Flavius, who had been secretary to the *Pontifex Maximus* Appius Claudius, exposed them to the people. From that time they were publicly known. Another species of tables, called *fasti annales* or *historici*, formed a chronicle of contemporary events, containing the names of the chief magistrates of the year, and a series of the more remarkable events noted in the order of the days of their occurrence; their arrangement being similar to that of a calendar, they received the same name.

FASTING, the partial or total abstinence of mankind and animals from the ordinary supply of aliment required to preserve them in a healthy and vigorous condition. The principal instances of fasting on record are those which have arisen from shipwreck, accidental imprisonment in mines, and similar accidents, from peculiar mental affections, or from the body being in a morbid state, or from the two latter combined. It would appear that various warm-blooded animals are capable of sustaining total abstinence much longer than human beings. There are pretty well authenticated instances of dogs and cats surviving for several weeks when accidentally confined in places where it was scarcely possible they could find nourishment. There are few well authenticated instances of human beings having been starved to death by a continuous and total deprivation of nourishment, but the general opinion is that the average period during which such deprivation could be sustained does not exceed a week. The use of water, even its external application, enables life to be sustained much longer. Abnormal conditions of body have frequently the same effect, but in some of these, as fever, while food is rejected, drink is partaken of freely. It is the consumption of liquids that explains the long voluntary fasts that have recently become familiar. Habitual fasting for periods of more than six or eight hours is condemned by medical authority as injurious to health.

FASTOLF, SIR JOHN, English soldier, was born near Yarmouth about 1378, and seems to have formed part of the household of the Duke of Norfolk, and afterwards of that of the Duke of Clarence, with whom he went to Ireland. He saw much service in the French wars, and distinguished himself in the battle of Agincourt, the capture of Caen, the siege of Rouen, and other events. He was knighted about 1417, and made governor of the Bastille in 1420. In 1422 he held the post of grand master of the household of the Duke of Bedford, and in the following year he became regent in Normandy and governor of Anjou and Maine. In 1429 he was ordered to bring supplies to the English camp in front of Orleans, which was then in a state of siege. He went to Paris and obtained the provisions, but when returning was attacked at Rouvray

by a French force much stronger than his own. In spite of this disadvantage, however, he succeeded in driving off the attacking party, mainly owing to the skilful manner in which he used barrels of harrings for defensive purposes. The battle is usually known, from the last-mentioned circumstance, as the Battle of the Herrings. Some have charged him with cowardly behaviour in the subsequent battle at Patay, and it is said that the Duke of Bedford deprived him of the Garter which had been conferred on him in 1426. This charge is, however, probably unfounded. In 1432 he was appointed English ambassador to the Council of Basle, and in 1441 he withdrew from the army. Between that year and 1454 he built a large castle at Caister, his birthplace, and in it he lived till his death in 1459. The Paston Letters contain a long account of his later life in Norfolk, and show him to have been keenly bent on amassing a large fortune. He has been regarded as the prototype of Shakespeare's Sir John Falstaff.

FASTS. Abstinence from food, accompanied with signs of humiliation and repentance or grief, is to be found more or less in almost all religions. Among the Jews fasts were numerous; but they must have all been founded on tradition, except that of the day of expiation, which was appointed by Moses. We find, however, many instances of occasional fasting in the Old Testament. Herodotus says that the Egyptians prepared themselves by fasting for the celebration of the great festival of Isis. So in the Thesmophoria at Athens, and in the rites of Ceres at Rome, it was practised. Protestants consider that Christ and his apostles give no precept respecting fasting. It was probably, however, early practised by the Christians as a private act of devotion. No public fast is spoken of in the most ancient times except that on the day of crucifixion. The Church of Rome distinguishes between days of fasting and of abstinence. The former are—1. The forty days of Lent; 2, the Ember days, being the Wednesday, Friday, and Saturday of the first week in Lent, of Whitsun week, of the third week in September, and of the third week in Advent; 3, the Wednesdays and Thursdays of the four weeks in Advent; 4, the vigils or eves of Whitsuntide, of the feasts of St. Peter and St. Paul, of the Assumption of the Virgin, of All Saints, and of Christmas day. When any fasting day falls upon Sunday it is observed on the Saturday before. The Greek Church observes four principal fasts: that of Lent, one beginning in the week after Whitsuntide, one for a fortnight before the Assumption, one forty days before Christmas. The Church of England appoints the following fixed days for fasting and abstinence, between which no difference is made:—1. The forty days of Lent; 2, the Ember days, at the four seasons; 3, the three Rogation days before Holy Thursday; 4, every Friday except Christmas day. Other days of fasting are occasionally appointed by royal proclamation. The church, however, gives no directions concerning fasting; and an old act of Parliament prohibiting meat on fast days was designed, not with any religious object, but for the encouragement of fisheries and navigation.

FATALISM, the belief in fate, or an unchangeable destiny, to which everything is subject, pre-established either by chance or the Creator. See **PREDERMINATION**, **WILL**.

FATA MORGANA, a singular aerial phenomenon seen in the Straits of Messina. When the rising sun shines from that point whence its incident ray forms an angle of about 45° on the Sea of Reggio, and the bright surface of the water in the bay is not disturbed either by the wind or current, when the tide is at its height, and the waters are pressed up by currents to

a great elevation in the middle of the channel, the spectator being placed on an eminence, with his back to the sun, and his face to the sea, the mountains of *Mæna* rising like a wall behind it, and forming the back-ground of the picture, on a sudden there appear in the water, as in a catoptric theatre, various multiplied objects—numberless series of pilasters, arches, castles, well delineated, regular columns, lofty towers, superb palaces, with balconies and windows, extended alleys of trees, delightful plains, with herds and flocks, numbers of men on foot or on horseback, and many other things, in their natural colours, and proper actions, passing rapidly in succession along the surface of the sea during the whole of the short period of time that the above-mentioned conditions remain. All these objects which are exhibited in the *Fata Morgana* are proved by the accurate observations of the coast and town of Reggio by P. Minaai to be derived from objects on shore. If, in addition to the circumstances we before described, the atmosphere be highly impregnated with vapour and dense exhalations, not previously dispersed by the action of the wind and waves, or rarefied by the sun, it then happens that in this vapour, as in a curtain extended along the channel to the height of above forty palms, and nearly down to the sea, the observer will behold the scene of the same objects not only reflected from the surface of the sea, but likewise in the air, though not so distinctly or well defined as the former objects on the sea. Lastly, if the air be slightly hazy and opaque, and at the same time dewy, and adapted to form the iris, then the above-mentioned objects will appear only at the surface of the sea, as in the first case, but all vividly coloured or fringed with red, green, blue, and other prismatic colours. As the day advances the fairy scene gradually disappears. A very singular instance of atmospherical refraction is described in the Philosophical Transactions as having taken place at Hastings, England. The coast of Picardy, which is between 40 and 50 miles distant from that of Sussex, appeared suddenly close to the English shore. The sailors and fishermen crowded down to the beach, scarcely believing their own eyes; but at length they began to recognize several of the French cliffs, and pointed out places they had been accustomed to visit. From the summit of the eastern cliff or hill a most beautiful scene presented itself: at one glance the spectators could see Dungeness, Dover cliffs, and the French coast all along from Calais to St. Vallery, and, as some affirmed, as far to the westward even as Dieppe. By the telescope the French fishing-boats were plainly seen at anchor, and the different colours of the land on the heights, with the buildings, were perfectly discernible. This refractive power of the atmosphere was probably produced by a diminution of the density of its lower stratum in consequence of the increase of heat communicated to it by the rays of the sun powerfully reflected from the surface of the earth. (See *MIRAGE*.) Similar appearances occur also in the great sandy plains of Persia, of Asiatic Tartary, in Lower Egypt, on the plains of Mexico in North America, &c.

FATES (in Latin, *Parce*; in Greek, *Moirai*, from a root signifying to divide or portion out), the inexorable sisters who spin the thread of human life. Homer mentions neither their separate names nor their number. The appellation *Clotho* (the spinner) was probably at first common to them all. As they were three in number, and poetry endeavoured to designate them more precisely, *Clotho* became a proper name, as did also *Atropos* and *Lachesis*. *Clotho* means she who spins (the thread of life); *Atropos* signifies unalterable fate; *Lachesis*, lot or chance; so that all three refer to the same subject under different points of view. In Homer and Hesiod they appear as goddesses of human fate and individual destiny, both in life and death. Among the lyric poets they seem to have a general power over events, and are always present where anything is to be divided. In the narrowest signification they are the goddesses of death, as of that destiny which closes the scene with all. In this capacity they belong to the infernal world, and are daughters of Erebus and Night. As goddesses of fate they are the servants of Zeus and the offspring of Zeus and Themis. The former genealogy is the more modern. As daughters of Zeus, they have a share in the decisions of fate, and are commissioned by him to execute his commands. They regulate the future events in the life of man. They know and predict what is yet to happen. *Lachesis* is represented with a spindle, *Clotho* with the thread, and *Atropos* with scissors, with which she cuts it off. We find in the northern mythology three beautiful virgins, the *Nornæ*, who determine the fate of men. Their names are *Urd* (the past), *Varande* (the present), and *Skuld* (the future). See **NORTHERN MYTHOLOGY**.

FATHERS OF THE CHURCH. See **CHURCH (FATHERS OF THE)**.

FATHOM, a unit of length equal to 6 feet. It is chiefly used by sailors, who measure soundings, &c., in fathoms.

FATIMITE DYNASTY, a line of caliphs, pretended descendants of Fatima, the favourite daughter of Mohammed and of Ali her cousin, whom she had married. In the year 909 Abu-Mohammed Obaid-alla, giving himself out as the grandson of Fatima, endeavoured to pass himself off as the Mahady or Messiah predicted by the Koran. Denounced as an impostor by the reigning caliph of Bagdad he fled into Egypt, was captured and thrown into prison, but was soon liberated by the usurper Abu-abd-Alla, who seated himself on the throne held by the Aglabite dynasty for over a hundred years. The pretended Mahady was made caliph of Tunis, and his soldiers being animated with the idea that he was a messenger from heaven, he soon conquered all Northern Africa, from the Straits of Gibraltar to the borders of Egypt. His son and successor gained possession of the island of Sicily, and Moez, the fourth caliph, wrested Egypt from the Abbassides in 970, founded Cairo, and fixed his residence in its present suburb of Fostat. He subsequently acquired Palestine and a great part of Syria. His successor Azziz (975-996) consolidated his conquests, embellished Cairo with many monuments, and married a Christian, whose brothers he made patriarchs of Alexandria and Jerusalem. His son Hakem (996-1021) has rendered himself famous for his merciless persecution of the Christians, Jews, and orthodox Mohammedans, and gave the first impulse to the Crusades by his tyrannical conduct at Jerusalem. Declaring himself a manifestation of God, he became towards the close of his reign the founder of a new religion, now represented by the Druses in Syria, who expect his re-appearance as their Messiah. From his time the power of the Fatimites declined. On the death of Adhed, the fourteenth caliph, in 1171, the dynasty was extinguished, and a new one established by Saladin.

FATS. The fats and fatty oils are mixtures of various glycerin ethers, which are found both in plants and animals, the term fat being confined to those which are solid at the ordinary temperature, and oil to those which are fluid. In plants the fatty portion is found chiefly in the seeds, inclosed in small cells, but also in the pulpy part of the fruit, and is separated by pressure or trituration; in animals it is deposited in the cellular tissue, and is most easily separated by heating with water, when the fat melts, rises to the surface, and forms on cooling a cake

which is easily removed. There is no essential difference in the character of the fatty matters derived from the two kingdoms, though the fats themselves, for example, mutton suet, whale-oil, or hog's lard, may differ in the proportions of their proximate constituents. Generally, however, the vegetable fats are fluid, though containing solids; while the animal fats are usually solid, containing, however, some fluid portions, the exceptions being whale, sperm, seal, and fish oils. (See OILS.) Animal fats are easily separated into their liquid and solid portions by pressing them between folds of bibulous paper, the liquid or oil being absorbed, while the solid fat remains. By after treatment with water the oil is separated from the paper. To this portion the name *clain* or *olein* (which see) has been given, and to the solid fat *stearin* and *margarin*, which is a mixture containing palmitin and other glycerides. These bodies are respectively produced by the reaction of oleic, stearic, palmitic, and other fatty acids with glycerin, and the compounds are decomposed by an aqueous solution of potash or soda, and other metallic hydrates, the bases combining with the fatty acids, and liberating the glycerin. (See GLYCERIN and SAPONIFICATION.) A similar decomposition is even effected by superheated steam, and by sulphuric acid. In the latter case the acid combines with the glycerin, but sometimes also with the organic acids.

The fats are white or yellowish, have a slight taste, and sometimes a characteristic odour, are insoluble in water, but dissolve somewhat in alcohol, and readily in ether, benzol, turpentine, and bisulphide of carbon. They differ to some extent in their fusion points, but

all melt readily, and can be heated to between 400° and 500° Fahr. without change. Above that temperature they decompose, evolving inflammable gases, and a variety of hydrocarbons, acids, and acrolein, which has a most pungent odour, and is produced by the decomposition of glycerin. The fats are therefore incapable of distillation, and are thus distinguished from the volatile or essential oils. For the same reason they leave a permanent translucent stain on paper, which cannot be removed by heat. Their specific gravity is rather less than that of water. They act as solvents for sulphur, phosphorus, and other bodies which are insoluble in water, and are absorbed to a considerable extent by moist leather and by moist clay. When exposed to the air the fats and fatty oils absorb oxygen and undergo various changes. Some of the oils, for example, change to a solid, transparent mass; these are the drying oils. Some of the fats, on the other hand, especially if they have not been properly purified from mucous or albuminous matter, become rancid. This appears to be due to a sort of fermentation.

FATTY ACIDS, the most complete and perhaps the most fully studied homologous series of bodies in organic chemistry. The series has derived its name from the fact that the different acids are obtained from fats and oils by saponification with a base, and by decomposing with a stronger acid the salt of the acid formed. The acid can then be separated by distillation or by extraction with a solvent and crystallization. The following table comprises the fatty acids so far as known, along with the melting point:—

		Melting Point	Boiling Point	Source.
Formic Acid,	C H ₂ O ₂	9° C.	99° C.	Ants, nettles.
Acetic "	C ₂ H ₄ O ₂	17° C.	118° C.	Vinegar.
Propionic Acid,	C ₃ H ₆ O ₂	Volatile.	141° C.	Oxidation of oils.
Butyric "	C ₄ H ₈ O ₂	0° C.	163° C.	Rancid butter.
Valeric "	C ₅ H ₁₀ O ₂	Volatile.	175° C.	Valeian root.
Caproic "	C ₆ H ₁₂ O ₂	-2° C.	205° C.	Rancid butter.
Hepicolic "	C ₇ H ₁₄ O ₂	-10° C.	224° C.	Castor oil.
Caprylic "	C ₈ H ₁₆ O ₂	16° C.	236° C.	Rancid butter.
Nonyllic "	C ₉ H ₁₈ O ₂	12° C.	254° C.	Geranium.
Capric "	C ₁₀ H ₂₀ O ₂	30° C.	269° C.	Rancid butter.
Undecylic "	C ₁₁ H ₂₂ O ₂	28° C.	213° C.	Oil of rue.
Lauric "	C ₁₂ H ₂₄ O ₂	43° C.	226° C.	Bay berries.
Tridecylic "	C ₁₃ H ₂₆ O ₂	40° C.	236° C.	Cocoa-nut oil.
Myristic "	C ₁₄ H ₂₈ O ₂	54° C.	248° C.	Nutmeg butter.
Pentadecylic Acid,	C ₁₅ H ₃₀ O ₂	57° C.	257° C.	<i>Sigarius integer</i> .
Palmitic "	C ₁₆ H ₃₂ O ₂	63° C.	269° C.	Palm-oil.
Margaric "	C ₁₇ H ₃₄ O ₂	60° C.	277° C.	—
Stearic "	C ₁₈ H ₃₆ O ₂	69° C.	287° C.	Tallow.
Nondecylic "	C ₁₉ H ₃₈ O ₂	96° C.	—	—
Arachidic "	C ₂₀ H ₄₀ O ₂	75° C.	—	Butter, earth-nut.
Behenic "	C ₂₂ H ₄₄ O ₂	70° C.	—	Oil of Ben.
Lignoceric "	C ₂₄ H ₄₈ O ₂	80° C.	—	Beechwood tar.
Cerotic "	C ₂₆ H ₅₂ O ₂	87° C.	—	Bees'-wax.
Melissic "	C ₂₈ H ₅₆ O ₂	88° C.	—	—
Theobromic "	C ₂₄ H ₄₈ O ₂	72° C.	—	Cacao butter.

Besides this there is another series containing acrylic, oleic, stearic, doeglic and other acids, which are equally entitled to the appellation of fatty, both because they are obtained from oils or fats, are themselves of oily character, and when decomposed yield acids belonging to the previous series. As, however, they have a different composition, they are not included in the true fatty series, but are distinguished as the *Acrylic* series. There is still another series known as the *Linoleic* series, and including linoleic acid, ricinoleic acid, &c. The fatty acids, in addition to the natural sources above mentioned, can also be prepared artificially by certain typical reactions. The higher members also admit of isomeric variations; some of these have been prepared, but in one or two cases the acid naturally met with is not normal but is an isomer.

FATUITY. See INSANITY.

FAUCIGNY, a district of France, department of Haute Savoie, 36 miles long by 21 miles broad, and with an area of about 840 square miles. It is one of the loftiest districts of Europe, being partly traversed by the Pennine Alps, belongs almost entirely to the basin of the Arve, and has not more than one-third of its surface fit for culture. Pop. 102,000.

FAULT, in geology, a fracture of strata, accompanied by a sliding down or an upheaval of the deposits on the one side of the fracture to a greater distance than the other. Faults are frequently met with in the English coal beds, the miner coming unexpected upon an abrupt wall of other strata. The angle this makes with the plane of the bed he is working indicates whether he must look up or down for its continuation on the other side of the fracture,

the lowest level being almost always on the side of the obtuse angle. See *GEOLoGY*.

FAUN, the name given to the Roman gods of the woods, that is, a kind of spirits inhabiting the forests and groves, who were particularly revered by the cultivators of the ground. Their form was principally human, but with a short goat's tail, pointed ears, and projecting horns. They were clothed in the skin of a goat, or that of some other beast. They are sometimes crowned with vine branches, because, like the satyrs, they belonged to the train of Bacchus. Among the most famous antique statues of fauns are the old dancing faun in the Florentine Museum, and the young faun represented as a flute-player. The poets describe them as deformed and sensual; and we recognize this character in the ancient statues which have come down to us. They were considered as the sons of Faunus, who was revered as one of the most ancient kings of Latium, and was celebrated for his power of prophecy.

FAUNA (from *Faun*, which see), a collective word signifying all the animals of a certain region, and also the description of them, corresponding to the word *flora* in respect to plants.

FAURIEL, CHARLES CLAUDE, a French historian and critic, born at St. Etienne, 1772, and educated at Tournon and Lyons. He adopted eagerly the principles of the revolution, and served in the capacity of lieutenant under La Tour d'Auvergne. In 1794, after a year's service, he quitted the army, and in 1800 became secretary to Fouché, the minister of police, a position he resigned two years later, when he saw Napoleon making rapid strides to despotic authority. He had, meanwhile, made acquaintance with several literary celebrities, among others Mme. de Stael, Condorcet, and De Gerando, and devoted particular attention to the oriental languages. In 1810 he published a translation of the *Parthenais* of the Danish poet Buggesen, and soon afterwards two of the tragedies of Manzoni. In 1824-25 he published an edition of the *Popular Songs of Modern Greece*, giving the text with translations and valuable annotations. This work appeared during the Greek struggle for liberty, and increased the interest the French had shown in favour of the Hellenes. The revolution of 1830 placed some of his friends in power, and he obtained the chair of foreign literature in the Faculty of Letters at Paris. In 1836 appeared the first four volumes of his *History of Southern Gaul* under the title of *the German Conquerors*, a work which procured him the membership of the Academy of Inscriptions and Belles Lettres. He was one of the collaborateurs in the literary history of France, to which he contributed a valuable notice on Brunetto Latini. As joint conservator of the manuscripts in the Royal Library, he published a *History of the Crusade against the Albigensian Heretics*, a poem in the Provençal dialect, to which he added a translation and introduction. His last work, a *History of Provençal Poetry*, appeared two years after his death, which occurred in 1844.

FAUST, or **FUST**, JOHANN, a goldsmith of Maintz, one of the persons to whom the invention of printing is generally ascribed. It is, however, doubtful if he did more than advance money to Gutenberg, who had previously made some attempts with movable types at Strasburg. The third person concerned was Schöffer, who married the daughter of Faust, and who is allowed the honour of having invented punches and matrices for casting types, by means of which this grand art was carried to perfection. The first-fruits of the new process, that is a work printed with cast letters, appears to have been the *Mazarine Bible*, or *Forty-two-line Bible* (the latter name from the number of lines in a column), completed about 1455.

Another early work was *Durandi Rationale Divinorum Officiorum*, published by Faust and Schöffer in 1459, which was followed a year or two after by the *Catholicon Johannis Januensis*; after which, in 1462, succeeded the Latin and German Bible, so much sought for by those fond of early specimens of typography. There is reason to believe that Faust died of the plague in 1466, as the name of Schöffer alone is found in the books printed after that time at Maintz. Owing, perhaps, to a similarity of name some of the noted deeds of Dr. Faust have been ascribed in popular German legends to the printer. See *PRINTING*.

FAUST, or **FAUSTUS**, DOCTOR JOHN, a famous dealer in the black art, who lived in the first half of the sixteenth century. He was a real personage, though the facts of his life have almost entirely disappeared amid the legends and fables in which they have become wrapped up. By the evidence of contemporaries we know something of his career from about 1507 to 1540, our authorities being Melancthon, Trithemius, Franz von Sickingen, and others. He appears to have been born at Knittlingen in Suabia, and is said to have studied magic at Crauw. He is mentioned as appearing at Gelnhausen, Würzburg, Erfurt, Bamberg, and Wittenberg, and is said to have died at an advanced age, at Staufen in the Breisgau, in 1540. He appears to have been a charlatan and adventurer who travelled from place to place, putting himself forward as a physician, alchemist, and astrologer, and as a great magician and enchanter. At Würzburg he professed that he could perform all the miracles that Christ performed, and at Wittenberg he claimed that the successes of the imperial troops in Italy had been brought about by his magical powers. Among the credulous and ignorant he naturally found many to put faith in his claims and at last his name became associated with a whole series of marvels. The first literary work of which he is the subject was published at Frankfurt in 1587, by Johann Spies, and professes to narrate the History of Dr. John Faust, the Famous Enchanter, and Professor of the Black Art. Enlarged editions soon appeared and the book was translated into English (about 1588), Low German, Flemish, and French. In it we find most of the famous stories associated with Faust's name: how he sold himself to the devil for a period of twenty-four years; how, by the aid of the fiend Mephistopheles, he and his attendant and pupil, Wagner, were able for this time to enjoy all sorts of sensual delights and to travel about performing the most marvellous exploits, and how at last, when the end of the fatal compact arrived, after a night of dreadful tempest, his body was found almost torn limb from limb, lying on a dunghill at the village of Rimplich, near Wittenberg. It was on the English translation of Spies's book that Marlowe's great tragedy—*The Tragical History of Doctor Faustus*—was based. In 1599 the legendary history of Faust appeared at Hamburg in a new form, as narrated by G. R. Widmann, a zealous Lutheran, always eager to draw a lesson from the events with which he deals. In an altered edition of this by Pfitzer (Nürnberg, 1674) we first find the germ of Goethe's *Margaret*, the maiden whose fate is so tragically connected with that of Faust, in the great drama of the German poet. Gounod's opera *Faust* is not unworthy of Goethe's wonderful poem on which it is based.

FAUSTINA: 1. The wife of the Emperor Antoninus Pius; and 2, her daughter, who was afterwards married to the Emperor Marcus Aurelius Antoninus. The historians of the period have interperated their descriptions of the flourishing state of the empire under these Antonines with scandalous anecdotes of their wives. But in vindication of the younger

Faustina, who was accused of the grossest excesses, it cannot be denied that her own husband Marcus Aurelius, who, by his excellent character, and his devotion to philosophy, obtained the surname of the philosopher, gave her the credit of being an exemplary wife. Wieland has attempted to defend her against the invectives of the historians of the emperors.

FAVART, CHARLES SIMON, creator of the serio-comic opera in France, born 1710, was the son of a pastry-cook. Favart received part of his education at the college of Louis-le-Grand, and devoted himself to poetical pursuits. His first poem—*La France délivrée par la Pucelle d'Orléans*, obtained the prize in the Jeux floraux. But his poetical reputation rests principally on his numerous productions for the *opéra aux Italiens*, and the comic opera. The latter, with which Favart was closely connected, was suppressed in 1745, through the intrigues of the former, which was jealous of its success; and Favart was obliged to assume the direction of a company of itinerant actors, which followed Marshal Saxe into Flanders. He also wrote, in conjunction with the Abbé Voisenon, a number of his best productions, in the composition of which Madame Favart also participated. The number of his works is very great; and many of them, as for instance *Soliman II.*, or the Three Sultaneesses, *Ninette à la Cour*, *La Chèreuse d'Esprit*, *L'astrologue de Village*, &c., have been translated into foreign languages. He died, 1792, at the advanced age of eighty-two years. Original and lively ideas, graceful and natural expression of tender feeling, a skilful delineation of characters mostly rural, and a pure and easy diction in verse as well as prose, are the attributes of Favart's muse.

FAVERSHAM, a municipal borough and seaport of England, county Kent, on a branch of the Swale, 45 miles E.S.E. of London. It consists principally of four spacious streets, with a market-place in the centre, and there are three suburbs, one of them on the opposite side of the creek. It has a handsome cruciform church, several large elementary and higher grade schools, a literary institute with a lecture-hall and reading-room, &c., a recreation ground, &c. The chief manufactures are gunpowder, Roman and Portland cement, bricks, and beer, and there is an oyster fishery. Vessels of 200 tons come up to the town, importing timber, iron, coal, &c., and exporting corn, hops, fruit, wool, &c. Pop. (1891), 10,478; (1901), 11,290.

FAWCETT, HENRY, an English statesman and writer on economic science, son of Mr. W. Fawcett, a magistrate of Salisbury, was born in that city in 1838. He was educated at King's College School, London, and at Trinity Hall, Cambridge, of which he was elected a scholar; he graduated as seventh wrangler in 1856, and was then elected a fellow of his college. He took his M.A. degree in 1859. He was totally deprived of sight while out partridge shooting by the accidental discharge of a gun in September, 1858, but this did not prevent him from continuing his studies, or indulging in the open-air exercise and healthy sport to which he had been formerly accustomed. He became an extensive contributor of articles on politics and political economy to various magazines and reviews, and his recognized ability procured for him the professorship of political economy at Cambridge in 1868. That year was also marked by the publication of his standard work, *A Manual of Political Economy*, republished with additions in 1869 and 1874. He afterwards published *Lectures on the Economic Position of the British Labourer* (1865), *Pauperism, its Causes and Remedies* (1871), *Speeches on Some Current Political Questions* (1875), *Free Trade and Protection* (1878), in combination with his wife (née Millicent Garrett)

a volume of essays and lectures on political and economical subjects (1872), and *Labour and Wages* (1884). He was unsuccessful as a parliamentary candidate for Southwark in 1860, Cambridge, 1862, and Brighton in 1863, but was returned for the last in 1865, and re-elected in 1868. His constituents rejected him at the general election of 1874, but Hackney accepted him several weeks later. On the formation of the Gladstone administration in 1880 Fawcett was appointed postmaster-general, and in that capacity introduced many valuable reforms and new institutions, particularly in the money-order system, the savings-bank, annuities, and life insurance provisions, the telegraph service, reply post-cards, and the parcels post. His death occurred at Cambridge on the 6th November, 1884. *A Life of Henry Fawcett* by Sir Leslie Stephen was published in 1885.

FAWKES, GUY. See **GUNPOWDER PLOT**.

FAYAL, one of the Azores, lon. 28° 41' W.; lat. 38° 31' N. It is of a circular form, about 10 miles in diameter, rising abruptly from the sea, reaching, in the centre, to the height of 3000 feet. The climate is good and the air always mild and pure. The cold of winter is never felt, and the heat of summer is tempered by refreshing winds. It produces plenty of pasture for cattle; birds are numerous, and plenty of fish is caught on the coast. The chief place is Villa Horta, or Orta. The origin of the island is volcanic. The soil is very fertile. It produces, in abundance, wheat, maize, flax, and almost all the fruits of Europe. Oranges and lemons abound. It has an important commerce with Europe and America. The population in 1890 was 58,921.

FAYALITE, a mineral found in the volcanic rocks of Fayal. It is opaque, green or brown, sometimes iridescent, and consists chiefly of ferrous silicate, but with small quantities of magnesia, lime, and the oxides of manganese, copper, lead, and aluminium. It is magnetic, fuses before the blowpipe, and is readily acted on by nitric acid. It has been met with also at different localities in Ireland. A substance closely resembling it has been formed artificially.

FAYENCE. See **FAÏENCE**.

FAYETTE, GENERAL LA. See **LAFAYETTE**.

FAYETTE, MARIE MADELEINE, COUNTESS DE LA. See **LAFAYETTE**.

FAYETTEVILLE, a post town of North Carolina, capital of Cumberland county, near the west bank of the north-west branch of Cape Fear River. It has a pleasant and advantageous situation at the head of steamboat navigation. Pop. (1880), 3485; (1890), 4222.

FAYOUM, FAYUM, or FAY-YUM, a province of Egypt, on the west of the Nile, from which it is distant some 15 or 20 miles, being also about 40 miles south-west of Cairo. It has an area of about 500 square miles, occupies a depression, and forms a sort of oasis surrounded by the desert and watered by the Bahr-Yusuf (Joseph Canal), which conveys the water of the Nile through a gap of the mountains that here extend north and south on the west of the river valley. In its lowest portion lies Lake Birket-Karun or Birket-el-Karun (the ancient Mœris), the surface of which is 180 feet below sea-level. The province is irrigated by innumerable canals and water-courses, the superfluous waters finding their way to the lake, and presents a scene of extraordinary fertility, where are cultivated the sugar-cane, cotton, rice, olives, the vine, orange, and other fruits. It is connected by railway with Cairo, and light railways and roads have been constructed in the province. The chief town is Medinet-el-Fayoum. The Fayoum contains the ruins of ancient Arsinoë. Pop. (1897), 371,006.

FEATHER ALUM, a name given to native hydrated sulphate of aluminium found in the United States, in Chili, in New South Wales, and other places, and to the double sulphate of aluminium and iron produced by the weathering of pyritiferous shales, and found at Hurler, in Scotland, and at various foreign localities. Both substances crystallize in fine fibres, giving a feathery appearance to the rock in which they occur.

FEATHERS, the form which the dermal appendages assume in birds, agreeing in mode of development, but differing in form from hairs and scales. The parts of a feather, such as that of which a quillpen is made, are the axis (*scapus*) and the lateral appendages. The scapus consists of a hollow cylinder or quill (*calamus*), and a four-sided solid portion (*rachis*). On either side of the rachis are the *barbs*, and these, with the rachis, make up the *vane* (*vestillum*) of the feather. The barbs are flat plates attached so that their planes are at right angles to the axis of the shaft. On the edges of the barbs are set the *barbules*, which interlock with those of adjacent barbs, and thus give strength to the vane. The calamus has an aperture at its lower end, and another on the under side, where the calamus joins the rachis, the latter being grooved from this point to the tip. The feather is developed on a papilla which is grooved vertically and transversely, these grooves being the moulds in which the horny matter of shaft and barbs respectively is deposited, the tubular barrel being the sheath of the papilla, which communicates with the interior of the growing feather by the lower opening of the calamus, just as the pulp of a growing tooth receives nourishment from the papilla by an orifice in the tip of the fang. Usually the mould of the feather is only on one side of the papilla; but when it is present on both sides the feather has an *after-shaft* (*hyporachis*), which is usually smaller than the chief vane. The description just given is that of a *contour-feather* or *penna*, as in the wing or tail. A *plumule* of down consists of a vane with a very small shaft; a *penna-plumule* has a larger shaft; and a *floplumule* has a very small vane on a long slender shaft. In these three kinds, which are protective, and take no part in flight, the barbs are not fastened together. The feathers of birds are periodically changed. This is called *moulting*. When feathers have reached their full growth they become dry, and only the tube, or the vascular substance which it contains, continues to absorb moisture or fat. When, therefore, part of a feather is cut off, it does not grow out again, and a bird whose wings have been clipped remains in that situation till the next moulting season, when the old stumps are shed, and new feathers grow out. If, however, the stumps are pulled out sooner (by which operation the bird suffers nothing), the feathers will be renewed in a few weeks. The *powder down patches* of the heron are plumules which break off into powder as they are developed. The inhabitants of the high northern latitudes use the skins of several sorts of water-fowl, with the feathers on, as clothing. The Greenlander makes use of the eider-duck, wearing the feathers next to the body, and thus endures the extreme cold of his climate. The ancient Mexicans formed various kinds of pictures, in the manner of mosaic, from the splendid feathers of the humming-bird; but they were necessarily very imperfect. Feathers make a considerable article of commerce; particularly those of the ostrich, heron, swan, peacock, goose, &c., for plumes, ornaments, beds, pens, &c. Geese are plucked in some parts of Great Britain five times in the year; and in cold seasons many of them die by this barbarous custom. Those feathers that are brought from Somersetshire are esteemed the best, and those

from Ireland the worst. The best method of curing feathers is to lay them in a room exposed to the sun, and when dried to put them in bags and beat them well with poles, to get off the dirt.

FEATHERS, COMPOSITION OF. Feathers have been often analysed, but few bodies of definite character have been obtained from them. The whole feather consists of carbon, hydrogen, nitrogen, oxygen, and sulphur, and both when acted on by strong acids, and when distilled destructively, yields the decomposition products of protein compounds in general. The feathers of some birds contain silica in considerable proportion, while the red spots on the wings of the *turaco* have been shown to contain copper. The colouring matters in other cases are of organic origin, but very little is known about them.

FEBRICULA. See **FEVER**.

FEBRUARY, from the Roman goddess *Februa* or *Februa*, who presided over the purifications (for example, for lying in), and is sometimes confounded with June. It is the second month in the year, and has twenty-eight days, except in leap-year, when it has twenty-nine. This latter number of days it had originally among the Romans, until the senate decreed that the seventh month should bear the name of Augustus, when a day was taken from February and added to August to make it equal to July in number of days. In this month the Romans held a feast called *Februalia* or *Lupercalia*, which lasted from the 18th to the 28th of February, and in which purifications were practised by the living, and a kind of expiatory sacrifices offered for the dead.

FÉCAMP, a town, France, in the department of Seine-Inférieure, at the mouth of a stream of the same name, 23 miles north-east of Havre. It stretches along a narrow hollow, inclosed by two parallel ranges of hills, and has a parish church, which originally belonged to the famous abbey of Fécamp, a school of hydrography, manufactures of cotton, linen, and woollen goods, sugar-works, tanneries, building-yards, several mills, a valuable fishery, and a spacious harbour with deep water and good anchorage. The town was celebrated for its herring fishery as early as the thirteenth century. Pop. (1896), 13,679.

FECULA, a name applied to all kinds of starch, or, generally, to the matter which subsides from cold water in which vegetable substances have been washed after being bruised or rasped. See **STARCH**.

FEDERAL GOVERNMENT. Federal is derived from the Latin *fedus*, a league, treaty, covenant, and applied to the governments of confederations, which consist of several united sovereign states, as, for instance, the Swiss Republic, the United States of North America, Mexico, &c. The degree to which such states give up their individual rights as sovereign bodies may be very different. Thus, the old German Empire was a confederation under a head, and yet one member of it might wage war with another; whilst the different members of the United States have given up, among other things, all political power in so far as it relates to foreign affairs. In the Swiss Confederation the different members are allowed to conclude treaties with foreign powers, if they are not expressly prohibited by the constitution. It must be observed that every confederation has not a federal government, because sometimes a confederation consists merely of a union between a number of states, not stricter than a treaty, defensive and offensive, between two states, as, for instance, the former Germanic Confederation.

FEE, or *feudum*, in law, properly signifies an inheritable estate in land, held of some superior, or lord; and in this sense it is distinguished from *allodium*, which is land held by absolute ownership. It is the theory of the English law that all the lands of the

kingdom, except the royal domains, are held in fee, or by a tenure, of some superior lord, the absolute or allodial property being only in the king, so that all the tenures are strictly feudal. This was a very significant practical doctrine while the feudal system flourished in Europe in all its vigour; and the remnants of it are still blended, in a greater or less degree, in the land titles, but rather as a theoretical doctrine, from which certain inferences are drawn, than a plain, direct, practical fact; for the property of the proprietor in land held in fee-simple, in England, is as absolute, to all intents and purposes, as where the land titles are allodial, there being no practical or theoretical doctrine of a tenure, or holding under a superior. In all countries property in lands, as well as chattels, is derived through the laws, and is guaranteed by the government; and universally the property, in both lands and chattels, reverts to the government, in case of there being no person who can claim it, either as an heir or purchaser; though, in respect to personal property, the government does not always avail itself of the right, but grants the property to persons who find it, in certain cases. But this right to inherit, or succeed to property, in the absence of all other claimants who have any right, is not what is meant by the theoretical, abstract property which the king is supposed to have in all the lands of the kingdom, but of which he cannot now avail himself, in respect to a great part of them, to any practical purpose whatever.

The simplest estate is that of a fee-simple, and such an estate can be had only in property that is inheritable and of a permanent nature; for we speak of a fee-simple in lands and franchises, but never in ships or goods. Though tenements are said to be possessed in fee-simple, yet this is in reference to the land, which includes things attached to it; but if one puts a building upon another's land by his permission, the building is his personal property, in which he cannot have a fee-simple; but if he puts it on his own land, he then may have a fee-simple in the land and tenement, considered as one subject. A fee-simple is the estate out of which other lesser estates are said to be carved; as a fee-conditional, such as a fee-tail (see *ENTAILS*), and a base fee, which is also, in effect, a conditional fee; as if lands be granted to certain persons, tenants of D, who are to have the lands only as long as they continue to be tenants of D: this is a base fee. A conveyance to a grantee and his heirs generally, and without qualification, gives a fee-simple; but if the estate be limited to certain heirs, or limited in time, or have any condition or qualification which may defeat or terminate it, it is something less than a fee-simple.

FEEJEE. See *FIIJ*.

FEELING is properly a synonym for sensation, or that state of consciousness which results from the application of a stimulus to the extremity of some sensory nerve. It thus includes all the senses which are reducible to modifications of touch. But popularly feeling is restricted to what is known as common sensation, or the sensibility of the general surface of the body to impressions produced by touch, as well as to the sensitiveness of certain organs, as the pericosteum of bone. Feeling in this sense is diffused over the whole surface, and in man the different impressions by contact are apprehended by certain structures with which the extremities of the nerves are connected, these auxiliaries being most numerous on the most sensitive parts as the finger-tips, and the lines where skin and mucous membrane pass into each other. These structures are papillae or conical elevations of the derma in which the nerves end, and which are richly supplied with blood-vessels. Touch corpuscles are enlargements of the sheath of

the nerve which surround its extremity. Touch is rarely exercised without another impression, the sense resistance, or the muscular sense, being called into play. The feeling possessed by pericosteum and bone, when injured, is manifested as pain, but of other impressions equally powerful we are not conscious. Thus impressions made on the terminal filaments of the sympathetic system do not manifest themselves as pain which we can localize, unless the injury is very severe, as in some diseases of the intestines. Many disturbances of internal organs manifest themselves only by 'sympathetic' phenomena, as pain in the shoulder when the liver is irritated, in the arm when the heart is affected, and the like. Special apparatus is not essential to the exercise of common sensation, though it may help in the analysis of impressions. Thus some of the lower animals, as Protozoa, in which hitherto no organs have been detected, respond to impressions by contact. Here there is neither afferent nerve to carry impressions inwards, nor a centre to receive impressions and transmit the appropriate stimulus, nor efferent nerves to convey that stimulus. The reflex act of withdrawing from contact, as does the foot of the sleeper when it is touched, cannot in the animal, however, be put down as the result of displacement of the granules and fluids of which its body is composed, though in the sensitive-plant and sundew the shrinking under irritation is due to as purely a mechanical operation as the drooping of hygroscopic moss in drought, its erecting itself when moisture is applied.

FEITH, RHYNVIS, one of the first modern poets of Holland, and with Bilderdijk the restorer of degenerated Dutch poetry, was born at Zwoll in Over-Yssel, in 1763. He early displayed the happiest talents for poetry, and, after having studied law at Leyden, resided from 1770 in his native city, and pursued his favourite studies. He was made burgo-master, and afterwards receiver at the admiralty college in Zwoll, but did not cease to cultivate the art of poetry, and to enrich Dutch literature by excellent works. Several of his works obtained prizes from the literary societies of Holland. The Poetical Society of Leyden awarded to him the two first prizes for two poems in memory of Admiral Ruyter. He tried his powers in almost every department of poetry. In his earlier years he was too much inclined to the pensive and sentimental style of Bellamy (which see). It predominates particularly in his romance Ferdinand and Constantia (1785), and, through his example, has for a long time prevailed in Holland. His *Grave* (*Het Graf*, 1792) is the first distinguished didactic poem since the revival of Dutch poetry. This poem, with a good plan, with many excellent passages, and charming melody, has also too much of the melancholy character. His *Old Age* (*De Ouderdom*, 1802) is free from this fault, but has no definite plan. Among his lyric poems, *Oden en Gedichten* (Amst. 1798), three vols., are several hymns and odes distinguished for great elevation and feeling. His ode on Ruyter is very celebrated. He also made that naval hero the subject of an epic poem. The best of his tragedies are *Thirza*, *Johanna Gray*, and particularly *Inés de Castro*. In connection with Bilderdijk he gave a better form to Haren's celebrated poem *De Geusen* (*Les Gueux*, *The Beggars*), the subject of which is the foundation of Dutch freedom. His poetical *Letters to Sophia on Kant's Philosophy* (*Brieven aan Sophie over de Kantiaansche Wijbegeerte*, Amsterdam, 1805) are a feeble effort of his old age. Among his prose works, his *Letters on different Subjects of Literature* (six vols. 1784) are distinguished, and contributed much to the dissemination of good taste, by their finished style and excellent criticisms.

FELANTIX, or **FELANTICH** (ancient *Cenatio*), a town in the island of Majorca, in a mountain valley, 28 miles S.W. of Palma. It is a very ancient but well-built place, consisting of several squares and spacious streets, and has a parish church, town-house, two schools, and an hospital. On an adjoining height is an ancient Moorish castle, with subterranean vaults. Manufactures: linen and woollen goods, brandy, and ropes. Trade: rice, coffee, sugar, wine, brandy, fruit, and cattle. Pop. (1897), 11,372.

FELICUDI (ancient, *Phenicusa*), one of the Lipari Isles, off the north coast of Sicily, 10 miles west of Salina. It is about 9 miles in circuit, presents to the sea bold and rugged cliffs of basalt, and has three lofty summits, evidently produced by an extinct volcano. The soil is both fertile and well cultivated. Pop. 800.

FELIDÆ. This family, which contains the most characteristic members of the order Carnivora, contains only one genus, *Felis*, which is divided into several subgenera. The characters of the family are: the possession of a slender, extremely flexible body, of great muscular power; the limbs are five-toed, the thumb of the anterior limbs not reaching the ground; the skull is relatively short, the facial portion much shortened, very broad, and giving, by its capacious zygomatic arches, abundant space for the powerful muscles which move the lower jaw. The incisors are three in number on each side, above and below; the powerful canines are trenchant on both edges, and are sometimes grooved; the premolars are three above and two below, the molars one above and below—in all, thirty teeth. The premolars are laterally compressed, the third upper tooth, the carnassial, or sectorial premolar, having only a minute inner tubercle. All are digitigrade. The divisions, as given by Cuvier, are:—Subgenus 1. *Felis*. Claws retractile; limbs low; tail as long as the body. A. Old World forms. *a* Lions (*F. leo*). Colour uniform; a mane. Africa and Western Asia. *b* Tigers (*F. tigris*). No mane; body striped. Whole of Asia, from the Altai and Amoor to Java and the Caucasus. *c* Leopards (*F. pardus*). Large species, with spots or rings, and round pupils. Africa and South Asia. *d* Servals (*F. serval*). Small spotted species. South Africa. *e* Cats (*F. catus*). Small, not spotted, sometimes striped; pupils elliptic vertical. B. New World forms. *a* Leonina. Colour uniform; no mane. Puma (*F. concolor*). *b* Leopard-like. Jaguar (*F. onca*).—Subgenus 2. *Cynailurus*. Claws not quite retractile. Hair on neck and between shoulders, long, manelike. Cheetah (*F. jubata*). Africa and South Asia.—Subgenus 3. *Lynx*. With ear-tufts and short tails. A. Old World forms. Caracal (*F. caracal*) and chaus. South Asia and Africa. B. New World forms. Canadian lynx (*F. canadensis*). Red cat (*F. fasciata*). Bay lynx (*F. rufus*)—all in North America. The family was represented in tertiary times by the cave tiger (*F. spelea*); an American species (*F. protopardus*); and an Indian (*F. cristata*). *Machairodus*, with its enormous sabre-like upper canine, ranged from miocene to pleistocene times in Europe.

FELIX, **ANTONIUS** or **CLAUDIUS**, procurator of Judea and freedman of the Emperor Claudius, is described by Tacitus as unscrupulous and prodigal both in his public and private conduct, and was living in adultery with Drusilla, wife of Asiaticus, king of Emesa, when Paul's discourse 'of righteousness, temperance, and judgment to come' (Acts xxiv. 25) made him tremble. He was recalled A.D. 62, and narrowly escaped condemnation at Rome, on charges which the Jews had lodged against him.

FELIX, **MARCOUS MINUCIUS**, a distinguished Roman lawyer, who embraced Christianity, and wrote

an excellent defence of it in a dialogue entitled *Octavius*. The period when he flourished is uncertain, some making it as early as the reign of Marcus Aurelius, while others make it as late as that of Diocletian. The purity of the Latin style, and some of the allusions to the existing state of the church, would seem to favour the earlier date; but it is not easy to set aside the direct testimony of Jerome, who, in a regular list of Christian writers, places him between Tertullian and Cyprian, thus fixing the period to about A.D. 280. The *Octavius* has been translated into most European languages.

FELLAH. See *EGYPT*.

FELLATAHS, **FOULAHs**, or **FULAHs**, a remarkable African race of the negro type, the original locality of which is unknown, but which is now widely diffused throughout the Sudan, where they form a kind of ruling aristocracy. The states or kingdoms of Senegal-Futa, Futa-Jalon, Haussa, Sokoto, &c., are in their hands, and they thus extend from Senegambia eastward to Lake Tchad. Though of the negro family, they differ widely in their physical characteristics from that race, having neither their deep jet colour, crisped hair, flat nose, nor thick lips. In person they are decidedly handsome, and mostly of a light copper colour; features regular and good, mouths small, European lips, and noses inclining to aquiline; hair soft and silky, well-defined black eyebrows, long eyelashes, and fine black eyes; tall, well proportioned, and of erect and graceful figure; some of the young women are very good-looking, and would be considered beautiful even in Europe. They are shrewd and intelligent; possess great influence in the districts where they reside; are extremely active, polished, and insinuating in their manners, and said to possess great bravery and perseverance. They are not very much addicted to trade or agriculture, leaving these chiefly to the subject peoples. They are mostly Mohammedans, to which religion they became converts about 400 years ago. They wear great numbers of greegrees or amulets, composed of paper of all sizes, upon which portions of the Koran are transcribed, and covered with silver, copper, or leather.

FELLENBERG, **PHILIP EMANUEL VON**, the founder of the institution for the improvement of education and agriculture at Hofwyl, in the canton of Berne, in Switzerland, was born in 1771. His father was a man of patrician rank, of the city of Berne, and, in consequence, a member of the government. His mother, a great-granddaughter of the celebrated Admiral Van Tromp, appears to have been distinguished no less for enlarged benevolence than for sincere piety, and to have exerted an important influence on his character and usefulness. The years 1795-98 he spent in travelling over France and Germany, visiting in preference the villages, and chiefly devoting his attention to the material, intellectual, and moral condition of the agricultural classes. He became convinced that the cause of all the existing poverty and misery was the absence of sound and rational instruction, and that the remedy lay in combining with a sound general education special training for the pupil's future trade. On his return to Berne he held for a short time an important municipal appointment, which he resigned in consequence of the illiberal policy of the government, and devoted himself to the improvement of the social and intellectual welfare of the peasantry. For this purpose he purchased the estate of Hofwyl, and established successively an institution for instructing the children of the poorer classes, a seminary for children in the higher grades of life, and a normal school. The pupils were all trained to work in the fields or at the bench, and the product of their labour was sufficient to cover the

expenses of their education. Fellenberg's scheme was at first ridiculed by his countrymen, and looked upon for a time with some suspicion by the government; but it was not long until its beneficial results attracted even the attention of foreign governments. Alexander I. of Russia conferred upon the philanthropist the decoration of St. Vladimir, and sent seven young nobles to be educated at his institution. Several foreign princes visited the establishment, and founded institutions on a similar plan. Fellenberg died in 1844. The Fellenberg institutions still exist, though on a less extensive scale, and are partly carried on by his descendants.

FELLOE, the circular wooden rim, or one of the segments thereof, which, with the addition of a nave and spokes, make the wheel of a carriage.

FELLOWS, SIR CHARLES, traveller and antiquarian, was born in 1799, at Nottingham. Without any claims to classical attainments, he collected with his unassisted means a vast amount of material for the learned to labour upon. He first explored the valley of the Xanthus in Lycia, in 1838, and discovered the remains of the two cities Xanthus, the Lycian capital, and Teos. Under the auspices of the trustees of the British Museum he made further explorations in 1839 and 1841, and succeeded in obtaining the marbles now in the Lycian saloon of the Museum. He was knighted by the queen in 1845. He passed the latter years of his life chiefly in the pursuit of agriculture in the Isle of Wight, and died in 1860. His principal works are *Travels and Researches in Asia Minor*, and *Coins of Ancient Lycia before the Reign of Alexander*.

FELLOWSHIP, an honourable position in some universities which entitles the holder, called a fellow, to an annual stipend for a certain period. Formerly the value of some of the fellowships at Oxford and Cambridge was as high as £500, and even £800, but great changes have recently been made in the number and emoluments of the fellows at both universities. The fellows are graduates, occupying apartments in the college to which they belong and having certain privileges as to commons or meals. At Cambridge there are in all about 400 fellowships, some of the colleges having as many as fifty or sixty attached to them. The average annual value is from £150 to £250 the latter sum being fixed as the maximum. The tenure of a fellowship is now limited to six years, but it may be prolonged under certain conditions. By recent statutes prepared for Oxford there are now two classes of fellowships, ordinary and tutorial. The emoluments of an ordinary fellowship are £200 a year, those of a tutorial fellowship usually £300. New fellows are generally elected by the head of the college to which they belong and the fellows. There are also fellows connected with Dublin University holding a similar position to those of Oxford or Cambridge, and in recent years a few have been attached to the Scotch universities, though their position is necessarily somewhat different.

FELo DE SE (Latin, a felon of himself), in law, a person that, being of sound mind and of the age of discretion, deliberately causes his own death. The laws have considered voluntary suicide a crime, and, as they could not reach the criminal himself, have inflicted a punishment on his friends and relatives, by ordering that his body should have an ignominious burial. But as no person of unsound mind is supposed to be capable of committing a crime, provision was made for a trial by a coroner's inquest or jury, which, being summoned for the purpose, pronounced whether the deceased killed himself, and also decided whether he was of sound mind and capable of being a *felo de se*, within the meaning of the law. As, however, the punishment in this case was strongly

repugnant to the feelings of humanity, and the jurors were more disposed to compassionate the relatives of a man who had committed such an act than to inflict an additional misfortune upon them, they most frequently, and, indeed, almost uniformly, gave a verdict of insanity, so that it had become a very general sentiment that the act of deliberate suicide was itself proof of an unsound mind. Another reason for this proceeding was, that by the laws of England a *felo de se* forfeited all his personal property to the king—another punishment on his survivors which the jurors would very naturally be led, by the same sentiments of humanity, to avert. The law was accordingly, for the most part, inoperative, as well as inhuman and unjust; and, in England, the barbarous mode of burying the felon's body at four cross-ways, with a stake driven through it, was abolished by 4 Geo. IV. cap. lii.; and by 33 and 34 Vict. cap. xxiii. forfeiture of property for the offence was abolished.

FELONY, in law, a term originally applied apparently to those crimes which were punished by forfeiture of lands and goods to the crown, in addition to any other punishment prescribed by law. As so used it was distinguished from a *misdeemeanour*, which was an offence that did not entail forfeiture as part of the penalty. Since the abolition of forfeiture of goods for felony by an act passed in 1870, this distinction no longer holds, and the word cannot now be said to have any very definite meaning in law. It may be applied to crimes entailing capital punishment, as well as to others for which capital punishment is not inflicted; as suicide is called a *felony*, and the self-murderer a *felo*, though it is an offence for which, from the nature of the case, the felon himself could never be punished. As to the offence known as *treason-felony*, see that article.

FELSPAR. This name was formerly given to the white, pink, or red mineral which is an abundant constituent of granite, gneiss, and other rocks, and which was supposed to be a distinct and independent substance. Further inquiry has proved that there are several kinds of minerals partaking of the same characters, and so the name has been transferred from the mineral to the natural family to which it belongs. The minerals comprised under this title are distinguished partly by their chemical composition, partly by their crystalline form. They all consist of silicate of aluminium combined with the silicates of calcium, sodium, or potassium; but it is seldom that analysis shows a potash felspar which does not contain soda. The felspars have been divided into the *orthoclase*, or potash-felspar group; *oligoclase*, or soda-felspar group; to which some add *anorthite*, or lime-felspar group, the different varieties being merely mixtures of the others. In the first, which includes *adularia*, *amazon-stone*, *perthite*, and *loxlolase*, the potash varies from 16 down to 4 per cent., the soda rising from nothing in *adularia* to 10 per cent. in *loxlolase*; in the second, which includes *albite* and *oligoclase*, with their varieties, the soda rises to 12 per cent., and lime takes the place of potash; in the third, in which is comprised *andesin*, *labradorite*, *bytownite*, and *anorthite*, with their varieties, the lime rises from 6 per cent. to 20 in *anorthite*, while the soda falls from 8 per cent. in *andesin* to 1 per cent. in *anorthite*. With regard to the proportion of silica there appears to be a gradation, but whether it is as regular as some mineralogists affirm is open to question, particularly as the formulae assigned even to the best known and most important species do not quite tally. The gradation referred to is exhibited by *anorthite*, containing 3 SiO₂, *labradorite* 3 SiO₂, *andesin* 4 SiO₂, *oligoclase* 5 SiO₂, and *albite* 6 SiO₂, in combination with 1 combining proportion of alkaline base and 1 of alumina, the lime

felspars of course showing a doubled formula. From these characters the felspars have been further characterized as basic, or containing excess of metallic oxide, such as anorthite; and acid, or containing excess of silica, such as albite and orthoclase.

The felspars are further distinguished by their crystalline form. The potash-felspar or orthoclase belongs to the monoclinic system, the soda-felspar or oligoclase, and the lime-felspar or anorthite, to the triclinic system. The two last divisions have been included under the term *plagioclase*. All the members of this family have a specific gravity between 2.4 and 2.8; hardness 6 to 7; vitreous or pearly lustre; opaque, but sometimes translucent. They fuse with difficulty, if at all, before the blowpipe, are not dissolved by the ordinary mineral acids, but are decomposed by hydrofluoric acid, and by digestion in carbonic acid water, which removes the alkali and disintegrates the mineral, producing clay or *kaolin*. The colour varies from gray and white, through different shades of pink to red; some have an iridescent or chatoyant appearance, or are green with silvery spangles, while others are yellow with golden spangles.

The felspars, especially orthoclase and oligoclase, are among the most important rock-forming minerals. They occur abundantly in granites and metamorphic rocks, and in all traps and basalts. In these rocks the felspar is mingled confusedly with the other constituents, or it forms imbedded crystals. In the hollows of granite, however, where the crystals have room to develop, large crystals quite separate, except the part by which they adhere to the wall of the cavity, are met with. The mineral is used for various purposes; the finer kinds, especially *adularia* or *moonstone*, amazon-stone, *aventurine* or *sunstone*, and *labradorite* being used either for jewelry or for making ornaments, while ordinary felspar is utilized in the preparation of porcelain glaze. See separate articles.

FELSTED, or FELSTEAD, a village of England, in Essex, 5½ miles west by south of Braintree, well known for its celebrated school founded in the sixteenth century by Richard Lord Riche, and at which Isaac Barrow and the sons of Oliver Cromwell were educated. Pop. (1891), 1859.

FELT, a fabric formed from wool, or wool and hair or fur, by rolling, beating, and pressure, generally with the use of lees or size. The process of felting is similar to that of fulling. The fibres of fur, hair, or wool are rough in one direction only, and thus they can glide among each other in such a way that when the mass is agitated the anterior extremities slide forward in advance of the body, or posterior half of the hair, and serve to entangle and contract the whole mass together. Articles of felt, such as rugs, carpets, tents, and caps, have been made from remote antiquity, and are still made and widely used among various Asiatic peoples. In Europe and America felt cloths are also made for several purposes, the finer kinds especially for carpets and table-covers, which may be dyed or printed and finished in various ways. In the machinery by which felt fabrics are produced, rollers with a rubbing and oscillating movement have generally an important action. The materials commonly used for felt hats are the furs of the rabbit and other animals, and the wool of sheep. The latter material is employed for common and medium hats, only the finer felt hats being made from fur. The fur is put through a *blowing-machine* in order to separate suitable from unsuitable hairs, and the former are then subjected to the action of the *forming-machine*. The fur is weighed out in single-hat quantities, and by means of this machine is blown on to a perforated copper cone revolving on a vertical axis. By withdrawing the air by an air-pump from within

the cone so as to cause a current, the fibres are made to adhere to it and form a loose felt coating, being meantime kept moist. When the coating is complete another copper cone is tightly fitted over it, and the mass is dipped into sulphuric acid and subjected to processes calculated to make the felt firmer. The hat is next reduced to the proper size by twisting and compressing processes. Soft hats and hard ones of course require somewhat different treatment, but both require to be *stiffened*. *Water-proofing* is employed in stiffening woollen hats, but for the finer hats *spirit-proofing* is adopted. *Water-proof stiffening* is formed from rosin, gum, borax, soda, and shellac, but in the other form alcohol or methylated spirit is used along with shellac. The hats, after being stiffened, are dyed. They now undergo the operation of *blocking* in order to give them their proper shape, and they are then stoved again. Pressing, finishing, trimming, shaping, and veluring (application of a velvet pad to the surface) complete the list of operations. The nap, or outer portion of the fur, is raised if required. Coarse varieties of felt are used for covering steam boilers and cylinders, steam-pipes, and otherwise as non-conductors. Asphalted felt is a coarse felt saturated with pitch, asphalt, or coal-tar, and used for covering sheds and other buildings, and a superior kind called *inodorous felt* is used for lining damp walls. Another kind is *asbestos felt*.

FELTHAM, or FELLTHAM, OWEN, an English author, was born about the beginning of the seventeenth century, and was descended of a respectable family in Suffolk. He resided for some time in the family of the Earl of Thomond, was in comfortable circumstances, had strong royalist sympathies, was well known to the literary men of his time, and published a work of great merit, entitled, *Resolves, Divine, Political, and Moral*. This book went through twelve editions by the year 1709. He died at Great Billing, Northampton, in 1668.

FELTRE, a town in Northern Italy, in the province of Belluno, about 44 miles N.W. from Venice. Feltre has a fine cathedral. Pop. 4000.

FELUCCA, a long, narrow vessel, generally undecked, of light draught, and rigged with large lateen sails. They also carry from eight to twelve large oars. They are common in the Mediterranean.

FEME COVERT, in law, signifies a married woman, in contradistinction to a *feme sole*, or single woman. See HUSBAND AND WIFE.

FEMERN, an island of Prussia, in the province of Schleswig-Holstein, off the north-east coast of Holstein, from which it is separated by the narrow and shallow Femernund; length, about 12 miles; breadth, 8 miles. It is very flat, and has a marshy, fertile soil. In the north and west parts are several lagoons. It has four lighthouses. The principal town is Burg. The inhabitants are chiefly agriculturists and fishers. Large quantities of stockings are knitted for exportation. Pop. 10,000.

FEMGERICHTE, FEMGERICHT, or FEMGERICHTE, were criminal courts of Germany in the middle ages, which took the place of the regular administration of justice (then fallen into decay), especially in criminal cases. These courts originated, and had their chief jurisdiction in Westphalia; and their proceedings were conducted with the most profound secrecy. Similar courts are said to have been first instituted by Charlemagne, but this is probably erroneous, and no explicit account of them occurs earlier than the thirteenth century. The total want of the means of procuring justice in a regular way enabled them to obtain, especially after the fall of Henry the Lion (1182), organization and extensive authority. When the Duchy of Saxony was dissolved,

the Archbishop of Cologne received Eger and Westphalia under the name of a duchy. It may have been at that time, that, in consequence of the complete disorder in the administration of justice, these secret, or, as they styled themselves, free tribunals, came into active operation, in the place of the courts which had hitherto been held by the bishops or royal commissaries (*missi regii*). Amidst the general distractions which were then prevalent in Germany, it was not difficult for them to acquire a tremendous authority, while they might, at the same time, produce some beneficial results; and the emperors afterwards increased this authority, by availing themselves at times of the *Femgerichte* to promote their own designs, and to intimidate by their means powerful nobles. In process of time, however, they degenerated, and no longer confined themselves to law and precedent, so that the secrecy in which they enveloped themselves only served as a cloak to their criminal purposes. The great number of their members who were dispersed everywhere made it easy for them to extend their influence through all Germany. In any German state the man who had a complaint against his neighbour, which could not be sustained before the ordinary judges, betook himself to a Westphalian tribunal. These secret tribunals were most terrible in the fourteenth and fifteenth centuries. It is therefore by no means surprising that so many voices were raised against them, and that in 1461 various princes and cities of Germany, as well as the Swiss Confederates, united in a league to enable all persons to obtain justice by their means, and to prevent any from seeking it from the secret tribunals. Particular estates likewise obtained from the emperor letters of protection against the violence of the Westphalian tribunals. The emperors themselves went no further than to make some unavailing attempts to introduce improvements into the constitution of the secret tribunals. These were bold enough, however, to oppose themselves to the emperors. Their influence was not entirely destroyed until the public peace (*Landfriede*) was established in Germany, and an amended form of trial and penal judicature was introduced. The last *Femgericht* was held at Zell, in the year 1568. Beyond the limits of Westphalia there were *Femgerichte* in Lower Saxony and other German states; but they had an authority far less extensive, and their jurisdiction was confined to a limited circle.

In consequence of the secrecy in which these tribunals were enveloped, little is known of their internal organization. The chief officer, who was generally a prince or count, had the supreme direction of the court, the jurisdiction of which comprised other free tribunals. The president of the secret tribunal was called the *Freigraf* (free count; for in early times those who administered justice in the provinces in the king's name were denominated counts). His associates, who concurred in and executed the sentences, were called *Freischöffen*, their sessions *Freidinge*, and their place of meeting *Freistuhl* (free bench or court). The *Freischöffen*, who were appointed by the counts, were scattered through all the provinces and cities of Germany. It is computed that their number amounted to 100,000. They recognised one another by certain signs and watchwords, which were concealed from the uninitiated; and they were hence called the *Wissende* or *illuminati*. They bound themselves by a tremendous oath; for they vowed 'to support the holy Feme, and to conceal it from wife and child, father and mother, sister and brother, fire and wind, from all that the sun shines on, the rain moistens, from all that is between heaven and earth.' They acknowledged the emperor as their superior, and for this reason generally made him one

of their number at his coronation at Aix-la-Chapelle. Admission, according to the strict rules, could take place only in the *Red land*, that is, in Westphalia. The assemblies of the tribunal were open or secret. The former were held by day in the open air; the latter by night in a forest or in concealed and subterranean places. In these different cases the circumstances of judgment and the process of trial were different. The crimes of which the secret tribunal usurped cognizance were heresy, sorcery, rape, theft, robbery, and murder. The accusation was made by one of the *Freischöffen*, who, without further proof, declared upon oath that the accused had committed the crime. The accused was once thrice summoned to appear before the secret tribunal, and the citation was secretly affixed to the door of his dwelling or some neighbouring place; the accuser remained unknown. If, after the third summons, the accused did not appear, he was once more cited in a solemn session of the court, which was called the secret *Acht* or *Ban*, and if still contumacious, was given over to the *Freischöffen*. The first *Freischöffe* who met him was bound to hang him not on a gibbet but on a tree, to indicate that he was put to death by one of them. If the condemned made any resistance it was lawful to put him to death in any other manner. A dagger was left by the corpse to show that it was not a murder, but a punishment inflicted by one of the *Freischöffen*. How many judicial murders were perpetrated in this manner from revenge, interested motives, or malice, may well be imagined. The *Freischöffe* who gave the condemned a hint for his escape was himself punished with death. Similar societies existed in Italy. (Stolberg's *Travels in Italy*, iii. p. 448.) Paul Wigand has thrown light upon this subject in his work *Das Femgericht Westfalens*, 1825 (new ed. 1893).

FEN, a place overflowed with water, or abounding with bogs, as the bogs in Ireland, the fens in Lincolnshire, Kent, and Cambridgeshire. These fens abound in duck, teal, mallards, pike, eels, &c., and an herbage that is very nourishing to sheep and cattle. The soil of fen lands is generally black and rich to a depth of 2 or 3 feet, and as the surface water filtrates through it to the subsoil, with proper management they will produce heavy crops of grass and corn. As they seldom have any natural outlet for draining this is generally done by machinery. Till lately windmills were employed in England for this purpose, but steam is now frequently adopted as the moving power, as by it the farmer can lay his lands dry at the most convenient season, whereas the operation of the windmill is always a matter of chance.

FENCES, continuous lines of obstacles artificially interposed between one portion of the surface of the land and another for the purpose of separation or exclusion. The kind of obstacle or material varies according to the articles to be excluded, confined, or separated, and the nature of the soil and situation. All fences are either live or dead, or a combination of these. Live fences are hedges, that is, rows of trees or shrubs, such as hawthorn, crab, black-thorn, holly, beech, box, &c., planted close together, and pruned on the sides. Dead fences are stone walls, structures of wood or iron, or mounds of earth, or ditches. Iron or wire fences have lately come into much use. Vast tracts of waste land in this country and of pasture in Australia have been inclosed in this manner. Strong wires are stretched on posts firmly secured in the ground at from 100 to 200 yards distance from each other; a number of lighter posts are put in at 4 to 6 yards distance; when the wires are stretched they are fixed to the smaller posts by staples if the posts are of wood, or threaded through if of iron. In England the tenant must repair and uphold the neces-

any fences, and without any special agreement the landlord may bring an action against the occupier for not doing so. By 7 and 8 Geo. IV. cap. xxix. the destruction of fences is declared to be punishable summarily with a fine of not more than £5, or in the case of a deer fence not more than £50. In Scotland the landlord is bound to put the fences in proper repair on the entry of the tenant independently of any stipulation in the lease, but the tenant must maintain them and leave them, with the exception of any tear and wear, in the state in which they were given over to him. A tenant has no claim on the landlord for such moneys as he has expended on buildings, fences, &c., unless under stipulation in the lease, such erections being considered as being made by the occupier for his own profit or advantage.

FENCING, the art of attack and defence with any weapon not a projectile, in which address and not sheer force is employed. Among the Romans the *lanista* (fencing-masters) were held in great esteem. They trained the gladiators and the legionaries in the use of the short sword and shield of that epoch. During the middle ages fencing as an art was neglected in consequence of the completeness of the suits of mail worn by the combatants. When, however, metal casing fell into disuse, fencing came again into vogue. The peculiar state of society in Italy in the sixteenth century rendered skill in fencing almost indispensable, and the Italians became the most expert swordsmen of that time. In Spain the art was subsequently improved, and the Italians adopted the improvement. From Italy the art travelled to France, where it was so favoured by the court and gentry that it rapidly took a fresh development, and a new school was established, which wrought in many essential particulars a radical change. The small sword or rapier having a point but no edge is a weapon demanding the highest degree of skill in its use for attack and defence. The fundamental principles upon which is based the defence of the person by this weapon is a peculiar application of the power of the lever, whereby the fencer who parries an attack causes the point of his adversary's blade to deviate from the direct course and throw it aside from his body by pressing or striking the *feible* (the part near the point) of his opponent's weapon with the *forte* (part near the handle) of his own. In the fencing schools the instrument adopted for exercise is called a foil; it has a guard of metal or leather between the handle and blade, which is made of pliant steel, and has a button at the end in place of a point. The parries are made with the weapon itself; the upper part of the body to the right is defended by the parry called *tierce*, the upper part to the left by the *carde*, and the lower part by the *seconde*. The fencer should rely more upon his sword hand for protection than upon his agility of leg; yet he must be active on his legs so as to advance, retreat, or lunge with effect. The knees should therefore be somewhat bent when the fencer is on guard, that he may be light and elastic in his movements. Thrusts are directed solely at the body; any cut on a limb would be counted accidental rather than intentional. An attack may be made by the mere extension of the arm, or accompanied by a lunge, that is, by advancing the body, stepping forward with the right foot without moving the left. An *engagement* means the crossing of the blades, a *dismengagement* slipping your foil under the opponent's and then pressing in the opposite direction; *riposte* the attack without pause by a fencer who has parried; *appel*, or beats with the right foot, *battements*, or *glissades*, beating the blade against the adversary's, or short gliding movements of one weapon along another, are motions intended to confuse an enemy and give opportunity for a thrust. Fencing with the

broadsword differs essentially from that with the foil, as the former has an edge as well as a point, and is therefore meant to cut as well as thrust. According to the instructions of drill-masters there are seven cuts, with corresponding guards, and three thrusts. Out *one* is a diagonal, downward cut at the left cheek of the adversary; out *three* is delivered with an upward slope at the left leg, and out *five* horizontally at the right side; cuts *two*, *four*, and *six* attack the right cheek, right side, and right leg respectively; and cut *seven* is directed vertically at the head. Guards *one* and *two* defend the upper portion of the body, the sword sloping upwards in an opposite direction to the opponent's; guards *three* and *four* protect the legs, the sword sloping downwards; guards *five* and *six* defend the sides, when the sword is held vertically, point downwards; and guard *seven* protects the head, the blade meeting the enemy's almost at a right angle. As in foil fencing, it should always be the care of the swordsman to receive the feeble of the enemy's weapon on the forte of his own.

FÉNELON, FRANÇOIS DE SALIGNAC DE LA MOTTE, one of the most venerable of the French clergy, the pattern of virtue in the midst of a corrupt court. He was born in 1651, at the Château Fénelon, in Périgord, of a family illustrious in church and state. A gentle disposition, united with great vivacity of mind and a feeble and delicate constitution, characterised his youth. His uncle, the Marquis of Fénelon, had him educated under his own eye at Cahors. The youth made astonishing progress, and easily mastered the most difficult studies. In his fifteenth year he preached with great applause. His uncle, fearing that success and flattery might corrupt so amiable a heart, advised his nephew to cultivate his talents in retirement. He placed him under the care of the Abbé Tronson, superior of St. Sulpice, in Paris. At the age of twenty-four Fénelon took holy orders, and performed the fatiguing duties of the parish of St. Sulpice. Harlay, archbishop of Paris, gave him the care of a society of female teachers devoted to the instruction of young Protestant converts, called the *New Catholics*, which office he discharged during three years. In this station he first displayed his powers of instruction and persuasion. The king, having heard of the success of his labours, appointed him to take charge of a mission to Saintonge for the conversion of the Huguenots, where his mild and convincing eloquence, joined to his amiable manners, met with astonishing success. It is to the honour of Fénelon that he would not accept this post except on condition that no other means should be employed than those of charity and argument. In 1681 his uncle conferred on him the priory of Caremagne. Soon after he wrote his first work, *Traité de l'Éducation des Filles*, which was the basis of his future reputation. In 1689 Louis XIV. intrusted to him the education of his grandsons, the Dukes of Burgundy, Anjou, and Berry. Fénelon was successful in forming the mind of the young Duke of Burgundy, heir presumptive to the throne of France, and sowed the seeds of every princely virtue in his heart; but his premature death blasted the pleasing anticipation entertained respecting him. In 1694 Fénelon was created Archbishop of Cambray. A theological dispute (see *QUÉTIEM*) with Bossuet, the virtual head of the French Church, terminated in his condemnation by Pope Innocent XII., and his banishment to his diocese by Louis XIV. Fénelon submitted without the least hesitation. In this period (1694-97) was written his letter to Louis XIV., first discovered in 1825, in which he speaks bold truths to the ambitious monarch (*Lettre de Fénelon à Louis XIV., avec facsimile*, Renouard, Paris, 1825). From this

time he lived in his diocese, sustaining the venerable character of a Christian philosopher, and scrupulously performing his sacred duties. He died in 1715.

His works in the departments of philosophy, theology, and the belles-lettres have immortalized his name. He was familiar with the best models of ancient and modern times, and his mind was animated by a mild and gentle spirit of benevolence. His style is fluent and pleasing, pure and harmonious. His most celebrated work is *Les Aventures de Télémaque*, in which he endeavoured to exhibit a model for the education of a prince. It was carried off and published by a valet employed to transcribe the manuscript. On the appearance of this work Louis manifested displeasure towards Fénelon, conceiving this historical romance to be a satire on his reign, and forbade the completion of the printing. Some malicious persons pretended, what Fénelon himself never thought of, that Calypso represented Madame de Montespan, Eucharis Mademoiselle Fontanges, Antiope the Duchess of Burgundy, Proteilaus Louvois, Idomeneus the exiled King James, and Sesostris Louis XIV. It is a masterpiece of its kind, delivering the most excellent morality in pleasing language. Two years after his death his heirs published the *Télémaque*, complete in two volumes. Since that time there have been numerous editions. In 1819 a monument was erected by public subscription to his memory; and the 7th of January, 1826, his statue, executed by the sculptor David, was placed at Cambray. Bausset wrote the Life of Fénelon, from original papers; and Champollion-Figeac has published a collection of his letters never before printed. The *Œuvres choisies de Fénelon*, with his eulogy by La Harpe, and a biographical and critical notice by M. Villemain, appeared at Paris, 1825, in six vols.

FENIANS, a name usually derived from Fionn or Finn, an Irish hero of the second century, assumed in recent years by those Irish who formed a brotherhood in their own country and in America, with the intention of delivering Ireland from the sovereignty of England, and establishing an Irish republic. About the end of 1861 the Fenian Brotherhood was regularly organized in America; and its chief council, consisting of a 'head-centre' and five other members, which had its seat at New York, soon had branches in every state of the Union; while at the same time large numbers joined the cause in Ireland. The close of the American civil war, when large numbers of trained Irish soldiers who had taken part in the war were released from service, was thought to be a convenient time for taking some decisive steps. Two risings were planned in Ireland, but they were both frustrated by the energetic measures of the British government, which had received timely information. The first, in September, 1865, was prevented by the seizure of the office of the Irish People, the Fenian journal published at Dublin, in which papers were found which revealed to the government the secrets of the conspiracy, and which led to the capture of the ringleaders. The second, in February, 1866, was as speedily suppressed by the suspension of the Habeas Corpus Act in Ireland. An invasion of Canada, attempted in the same year, failed as miserably as the attempt in Ireland, and convinced the Irish that they could not expect the aid from the United States on which they had hitherto counted. In 1867 the public mind was again alarmed by the two violent attempts made to release Fenian prisoners—the first at Manchester, and the second at Clerkenwell Prison, London. In the first instance they were successful; but in both cases the ringleaders were captured and executed.

The attempted assassination of the Duke of Edinburgh at Sydney on the 12th of March, 1868, is also ascribable to a Fenian conspiracy. In 1870 and 1871 raids were again made on Canada, but they were both as ridiculous failures as the first. The former was repulsed by the Canadian Volunteers with little loss on either side; and the latter, which was directed against Manitoba, was suppressed by the United States government. For several years the brotherhood seemed to have suspended all important operations, and many of the persons imprisoned for complicity were amnestied. From 1880, however, the troubled state of Ireland may be justly attributed, at least in part, to the machinations of the Fenians.

FENNEL (*Feniculum vulgare*), a plant of the natural order Umbelliferae, a native of some parts of England, bearing umbels of small yellow flowers, having finely-divided glaucous leaves, and growing to the height of 3 or 4 feet. By cultivation the seeds lose their acrid properties, and acquire an agreeable flavour; they are carminative, and are frequently employed in medicine. The leaves are often used in cookery as a seasoning or accompaniment of mackerel and other fish. A smaller species, sweet or Italian fennel (*F. dulce*), is commonly cultivated on the continent of Europe, and is used in salads, soups, &c. The oil of fennel is obtained from the seed. It is yellowish, somewhat thick, with an aromatic odour and sweet taste. It is lighter than water, and solidifies with moderate diminution of temperature. It is used as a carminative and stimulant. Other species are cultivated in various parts of the world. The genus is closely allied to that to which dill belongs (*Anethum*).

FENTON, ELLIAH, an English author and poet of considerable talent as well as learning, born in 1653 at Shelton, near Newcastle in Staffordshire, died in Berkshire in 1730. After going through the usual course of education at Jesus College, Cambridge, he took his bachelor's degree with the intention of entering the church. This design was, however, rendered abortive by his political principles, and he accepted an engagement in the capacity of usher. The Earl of Orrery afterwards, through the recommendation of his friends, was induced to make him his private secretary, and to place his eldest son under his care. In this situation he became acquainted with most of the wits of the age; and Pope, whom he assisted in his *Odyssey* (translating the whole of the first, fourth, nineteenth, and twentieth books of that poem), in particular was much attached to him. Pope's interest was exerted in his favour, both with Craggs, the secretary, and after his death with Lady Trumbull, to whose son he was appointed tutor. Besides the translations alluded to, he published a volume of poems (1717); *Marianna*, a tragedy; and the *Lives of Milton and Waller*, prefixed to editions of their works.

FEODOR, the name of three Russian princes.—FEODOR I., son of Ivan the Terrible, reigned from 1584–98. He was a feeble prince, who allowed himself to be entirely governed by his brother-in-law, Boris Godunov. With him the Russian dynasty of Rurik became extinct.—FEODOR II., son of Boris Godunov, reigned only for a short time in 1605.—FEODOR III., the son of Czar Alexia, reigned from 1676–82, warred with the Poles and Turks, and, by the Peace of Bukhtchisarai, obtained possession of Kiev and some other towns of the Ukraine. One of the most remarkable events of his reign was his successful opposition to the claim advanced by the nobility to a heritable right to the higher offices of the state, and his causing the so-called *Rasjid* or register of the nobility to be committed to the flames.

FEODOSIA (formerly *Cafis* or *Kafis*), a town in Russia, on the west angle of a magnificent bay in the south-east of the Crimea, in the government of Taurida. The ancient Theodosia, from which the modern Feodosia takes its name, was founded at a very early period by a colony of Greeks from Ionia, and its site was probably not far from its modern namesake. From 1286 to 1474 or 1475 this town was in the possession of the Genoese, except for a short interval about the end of the thirteenth century, when it was held by the Venetians. While in the hands of the Genoese it was the seat of an extensive commerce with the East by way of Astrakhan and the Caspian Sea, and at that time it is said to have had a population of 80,000. From the Genoese it was taken by the Turks, and after that its prosperity rapidly declined. Much has been done for it since it came into the possession of Russia, and it is still one of the most important towns in the Crimea. Pop. (1897), 27,238.

FEOFFMENT, an old mode of conveying freehold estates peculiar to English law, by which the conveyance was completed by a ceremony called livery of seisin. This ceremony is performed in two ways, either by deed or by law. When it is performed by deed both the person who conveys the estate (the *feoffor*) and the person to whom it is conveyed (the *feoffee*) have to be on the estate, and the feoffor then hands to the feoffee a clod, branch, or turf belonging to the land, or in the case of a house, the knocker, ring, or latch of a door. In this case the feoffee may be represented by an attorney, who must be appointed by deed. When the livery of seisin is performed by law, the feoffor and feoffee have merely to be within sight of the estate which is conveyed, to which the feoffor points, saying to the feoffee that the livery of yonder house or property is given to him. In this case the feoffee cannot be represented by an attorney, and he must enter into possession during the lifetime of the feoffor. Formerly there was nothing more necessary to the legal conveyance of any estate than the proceedings just described; but by act 8 and 9 Vict. cap. cvi. all feoffments must now be by deed, unless such as are made under a custom by an infant. It is usual to endorse in the deed the fact of the livery of seisin, but the fact of this not being done does not invalidate the deed, as the livery of seisin may be proved by parole evidence, and equity will supply the want of it where the deed was made for good and valuable consideration. Until the passing of the act already mentioned the conveyance by feoffment of a freehold greater than the feoffor possessed was a tortious conveyance which rendered the feoffor liable to forfeit the estate of which he was seized; but this act declared that such conveyance should no longer be held as tortious, but innocent, so that in a case of this nature a conveyance is valid with reference to the estate which the feoffor can lawfully convey, but no more.

FERÆ NATURÆ ('of a wild nature'), the name given in the Roman law to beasts and birds that are wild or non-domesticated, as contradistinguished from those which are *domitæ naturæ*, that is, tame animals, such as horses, sheep, &c. The Roman law held such animals as naturally belonging to the first person who should take possession of them, but regarded the right of possession as continuing only as long as the possessor kept them in confinement. As soon as the animal escaped it again became common property, and might be taken possession of by any other person who could capture it, unless the animal had an *animus revertendi*, that is, an intention of returning, which it was to be presumed it had, if it had been trained to return to its master's property, and was in the habit of doing so. This principle has

been adopted by both English and Scotch law. When such animals as are claimed as *feræ naturæ* make nests or burrows on any person's property, and have young, the young are held as belonging to this person as long as they are unable to fly or run away. Those persons who have the right of hunting, taking, or killing those wild animals which are included under the designation of game, have a qualified property in such animals as long as they continue within his liberty, but no longer. A person who keeps an animal indisputably *feræ naturæ* is responsible for any injury which it may do to the person or property of another. See Dog, in law.

FERDINAND, German emperors:—

1. **FERDINAND I.**, brother of Charles V., after whose abdication in 1556 he took the title of Emperor of Germany, although his claim to the title was not recognized by the electors till 1558. In 1526 or 1527 he became king both of Hungary and Bohemia, and after that period these two kingdoms remained attached to the empire, except when in 1619 an attempt was made to hand over the crown of the latter to Frederick V., the elector palatine. Ferdinand had been chosen King of the Romans in 1531. In 1559 he held a diet at Augsburg, in which the currency of the empire was regulated, and many religious grievances suffered by the Protestants were exposed. Ferdinand was of a mild and tolerant character, and in 1562 he obtained from the Council of Trent several religious privileges for his subjects.

2. **FERDINAND II.** was born in 1578, and succeeded his uncle Matthias as Emperor of Germany in 1619. He was of a dark and reserved character, had been educated by the Jesuits at Ingolstadt, and in his religious views was very unlike his ancestors, Ferdinand I., Maximilian, or even Rudolph and Matthias. His zeal was excited against every deviation from the decrees of the Council of Trent, and he obstinately adhered to bigoted and narrow views of religion. The Bohemians, jealous of the privileges which they had secured from Rudolph, and of which they saw that Ferdinand was disposed to deprive them, declared that he had forfeited the Bohemian crown, which they offered to the Elector Palatine Frederick V., a step which led to the outbreak of the Thirty Years' war. As the rest of Ferdinand's reign is inseparably mixed up with the history of that war, it is enough to refer to the article on that subject for further information regarding this emperor. The support of the league, and of the Elector of Saxony, John George I., placed him firmly on the throne of Bohemia, where he relentlessly persecuted the Protestants, banishing their preachers, and compelling many thousand industrious people to remove to foreign countries. He recalled the Jesuits, and tore the charter of privileges granted by Rudolph II. with his own hand. Ferdinand died Feb. 15, 1637, without having accomplished his most cherished design of destroying Protestantism and political freedom.

3. **FERDINAND III.**, son of the preceding, was born in 1608, and succeeded his father in 1637. Before his accession to the throne he had served in the Thirty Years' war, and he commanded the imperial troops at the victory of Nordlingen. From the experience which he obtained in this portion of his life of the miseries caused by the war, he was more disposed towards peace than his father, but he was nevertheless obliged to continue it for eleven years longer before the Peace of Westphalia (1648) was concluded. (See THIRTY YEARS' WAR, and WESTPHALIA, PEACE OF.) In the diet of 1653-54 some important changes were made in the administration of justice. Shortly before his death Ferdinand concluded a league with the Poles against the Swedes. Ferdinand died in 1657.

FERDINAND V., King of Arragon, who received from the pope the title of the *Catholic*, on account of the expulsion of the Moors from Spain, was the son of King John II., and was born March 10, 1458. On the 18th of October, 1469, he married Isabella of Castile, and thus brought about a close connection between Arragon and Castile, although both kingdoms continued to be governed separately, for Isabella allowed her husband no other share in the government of Castile than the privilege of affixing his signature to the decrees, and of uniting his arms with her own. With Ximenes they raised Spain to an eminence which she had never before attained. After a bloody war of ten years they conquered Granada (1491), the only kingdom of which the Moors yet retained possession in Spain; but the most brilliant event of their reign was the discovery of America, for which Isabella had furnished the ships, and which made them sovereigns of a new world. (See COLUMBUS.) This politic prince laid the foundation of the Spanish ascendancy in Europe by the acquisition of Naples (1503), by means of his general, Gonzalvo of Cordova, and by the conquest of Navarre (1512); but his policy was deceitful and despotic. These stains obscure the great qualities which made him the first monarch of his time. His efforts to aggrandize himself and confirm his power, and his religious bigotry, led him into great errors. For the purpose of domineering over the consciences of his subjects he instituted the court of the Inquisition at Seville in 1480, not perceiving that he thus gave the clergy a power which they would soon use against the monarch himself. Not less unjust and impolitic was the expulsion of the Jews (1492) and the banishment of the Moors (1501). Two years after the death of his wife Isabella, which took place in 1504, he married Germaine de Foix. He died in 1516.

FERDINAND I. of Bourbon, King of the Two Sicilies (previously Ferdinand IV. of Naples), born January 12, 1751, was the third son of Charles III., king of Spain, whom he succeeded in 1759, on the throne of Naples, on the accession of the latter to that of Spain. Ferdinand IV. took the reins of government into his own hands, January 12, 1767. In 1768 he married Maria Caroline Louise, daughter of the Empress Maria Theresa, who soon acquired a decided influence over him. Through her influence Acton was appointed prime-minister of Naples, the cabinet of which thenceforward became closely united with those of Austria and Britain, and dissociated from that of Madrid on the outbreak of the French revolution. As the cabinet of Naples hesitated to comply with the demand of France to renounce all connection with Britain, La Touche appeared with a French squadron before the capital, and compelled the court to accept the prescribed conditions. But after the death of Louis XVI. Ferdinand joined the coalition against France, and took part in the general war from 1793 to 1796. After two years of peace the victory of Nelson at Aboukir again engaged Ferdinand against the French, who, on the defeat of the Neapolitans under General Mack, took possession of the whole kingdom (January 23, 1799), and proclaimed the Parthenopean Republic—an act which the situation of affairs probably rendered necessary. The new republic did not last long. The court, which had fled to Palermo, returned to Naples in January, 1800, when a treaty was concluded between Spain and the first consul, by which the integrity of the Kingdom of the Two Sicilies was guaranteed. In 1806 Ferdinand was again driven from Naples by the French, and compelled to take refuge in Sicily, where he maintained himself by the aid of the British. Meanwhile Joseph Bonaparte,

the brother of Napoleon, and Joachim Murat, one of Napoleon's generals, reigned in succession in Naples, the former from 1806 to 1808, the latter from 1808 to 1815. The Congress of Vienna finally re-established Ferdinand IV. in all his rights as King of the Two Sicilies in 1814, while Naples was still occupied by Murat. But after the flight of the latter in March, 1815, Ferdinand once more entered Naples, June 17, 1815. In 1816 he assumed the title of Ferdinand I., king of the Two Sicilies. Almost all the good regulations which Joseph and Murat had established for the promotion of agriculture, education, the civilization of the lazzaroni, &c., were abolished. In 1820, in consequence of a revolution, Ferdinand was obliged to swear to support a new constitution. The Austrian arms, however, enabled him to disregard his oath and solemn promises. They re-established him (after he had been obliged again to leave Naples) in the possession of absolute power in 1821. He died in January, 1825, and was succeeded by his son, Francis I.

FERDINAND II., King of the Two Sicilies, born in 1810, was the son of Francis I. by his second wife, Isabella Maria, infanta of Spain, and succeeded his father on the 8th of November, 1830. The revolution of France in this year had unsettled the minds of men throughout the Continent generally, and was felt more particularly in the two divisions of the Neapolitan Kingdom, where a despotism of the most grinding description had long existed. The new sovereign at first made some concessions to his subjects; but as soon as he felt himself strong enough he returned to the old system, and gave his subjects to understand that henceforth his will was to be their only law, and that the least opposition to it would be followed by banishment or incarceration in a dungeon. This was no empty threat. Devoting much of his time to hunting, he left the government to be administered by priests and other favourites, and reserved his interference chiefly for occasions requiring the exercise of that mixture of obsequy and energy which formed the leading feature in his character. It was impossible that such a reign could be tranquil, and after a succession of partial outbreaks, the revolutionary year of 1848 brought matters to a crisis, during which Ferdinand II. earned the nickname of 'King Bomba,' by bombarding his capital from the forts commanding it. At the commencement of the insurrection, which first broke out at Palermo, and threatened to extend over both divisions of the kingdom, Ferdinand issued a decree promising a constitution, but ultimately, when he had by main force re-established his ascendancy, he retracted all his promises and established one of the vilest despotisms which has disgraced modern times. Great Britain and France, alarmed at the consequences, endeavoured, by friendly remonstrance, to check him in his mad career, and being only rebuked for presuming to interfere, testified their displeasure by withdrawing their ministers from Naples. This measure seems only to have made Bomba more resolute than ever to rule in his own way, and he died on the 22d of May, 1859, at the age of forty-nine, leaving his dungeons crowded with the best and bravest of his subjects. The retribution which he was permitted to escape in due time overtook his son, who lost his crown, which passed to Victor Emmanuel, king of Sardinia, thenceforward king of Italy.

FERDINAND III., JOSEPH JOHN BAPTIST, Grand-duke of Tuscany, Archduke of Austria, &c., born in May, 1769, succeeded his father, the Emperor Leopold II., as Grand-duke of Tuscany, July 2, 1790. This prince, whose character was at once mild and firm, governed his country in the spirit of his father. He was the first sovereign to acknowledge the French

Republic, and although he was compelled to join the first coalition against it, he took the first opportunity of withdrawing. In spite of this he was, in 1799, at the time of the second coalition, deprived of his dominions, which, at the Peace of Lunéville, in 1801, were given to the Prince of Parma. He afterwards received as compensation the Duchy of Salzburg, in Germany, with the title of elector. In 1805 he exchanged Salzburg for the Grand-duchy of Würzburg; in 1806 he joined the Confederation of the Rhine, and till 1813 remained a faithful ally of Napoleon. By the first Peace of Paris (May 30, 1814) he recovered his hereditary dominions. He died in 1824.

FERDINAND VII., King of Spain, eldest son of Charles IV., and of Maria Louisa of Parma, born in 1784; died in 1833. From the earliest years he manifested a strong dislike to the favourite Godoy (the Prince of Peace), who ruled both the king and queen; and in 1807 he was arrested as a conspirator. After the popular rising at Aranjuez, in March, 1808, his father was forced to abdicate in his favour. A month later, having been induced to meet Napoleon at Bayonne, he himself abdicated in turn, placing the crown at the disposal of Napoleon, who at once gave it to his brother Joseph. Ferdinand was kept a prisoner at Valençay till 1813, when Napoleon offered to re-establish him on his throne. He returned to Spain in March, 1814, having previously promised to maintain the constitution of 1812. In spite of his promise he annulled this constitution and dissolved the Cortes two months after his return, and in consequence of this and of the arbitrary nature of his government generally, a military insurrection broke out on the 1st of January, 1820. The rebels were at first successful, and Ferdinand was obliged to swear to the constitution of 1812; but having received support from Louis XVIII. of France, who sent an army to his aid, commanded by his nephew, the Duke of Angoulême, he was ultimately enabled to suppress the insurrection, and to make his authority once more absolute in Spain. Ferdinand was married four times, but only left one daughter, Isabella, by his fourth wife, Maria Christina of Naples. By a decree issued March 29, 1830, called the Pragmatic Sanction, he abolished the act of 1713, by which Philip V. had excluded women from the throne of Spain. He then left his crown to his daughter Isabella, to the exclusion of his brother, Don Carlos. It was during the reign of this king that the Spanish colonies in America broke away from the mother country.

FERENTINO (ancient, *Ferentinum*), a town in Italy, in the province of Latium, 6 miles northwest of the town of Frosinone. It belonged to the Volsci, under whom it rose to be a place of considerable importance, and it still exhibits the remains of ancient walls, built of hewn stone without mortar. It is the see of a bishop. Pop. 9096.

FERGUSON, ADAM, an eminent historical and political writer, was born in 1724, in Scotland, in the parish of Logierait, where his father was minister; died at St. Andrews in February, 1816. He was educated at Perth and St. Andrews, whence he removed to Edinburgh, to study for the ministry. He served as chaplain in the 42d Regiment of Foot, but, on the Peace of Aix-la-Chapelle, returned to Edinburgh, where, in 1757, he succeeded David Hume as keeper of the Advocates' Library, in 1759 was made professor of natural philosophy in the university, and in 1764 of moral philosophy. In 1774 he accompanied the Earl of Chesterfield on his travels. In 1778 he received the appointment of secretary to the commission sent to America in that year, to effect a reconciliation between the two countries. On his return in the following year he resumed the duties

of his professorship, which he continued to perform till 1784, when he resigned his chair. The remaining years of his life he spent partly in travelling on the Continent, and, after his return, in retirement at different places in the neighbourhood of Edinburgh. Among his chief works are an *Essay on Civil Society* (London, 1767); *Institutes of Moral Philosophy* (1769); an *Answer to Price on Civil Liberty* (London, 1776); and a *History of the Roman Republic* (London, 1783). In 1792 he published his lectures in the form of a *Treatise on Moral and Political Science*, in two vols. 4to.

FERGUSON, JAMES, an eminent experimental philosopher, mechanist, and astronomer, was born of poor parents at Keith, in Banffshire, in 1710; died in 1776. He learned to read by hearing his father teach his elder brother, and very early discovered a peculiar taste for mechanics, by making a wooden clock, after being once shown the inside of one. As soon as his age would permit he was employed by a farmer to tend his sheep, in which situation he acquired a knowledge of the stars and constructed a celestial globe. This extraordinary ingenuity becoming known to the neighbouring gentry, they enabled him to obtain instruction in mathematics and drawing, in which latter art his improvement was so rapid that he repaired to Edinburgh, and drew portraits in miniature, by which employment he supported himself for some years. In 1743 he repaired to London, where he was introduced to the Royal Society, and published astronomical tables and lectures. He also gave lectures in experimental philosophy, and among his hearers was George III., then Prince of Wales, who afterwards settled on him a pension of £50 a year. In 1763 he was chosen a fellow of the Royal Society, without the usual fees. He was well acquainted with astronomy, and experimental and natural philosophy; but his mathematical knowledge was very limited, and of algebra he knew little beyond the notation. His chief works are—*Astronomy Explained* on Sir Isaac Newton's Principles (1756—many editions); *Lectures on Select Subjects in Mechanics, Hydrostatics, Pneumatics, and Optics* (1760); *Analysis of a Course of Lectures on Mechanics, Pneumatics, &c.* (1763); *Young Gentleman's and Lady's Astronomy* (1768); *Introduction to Electricity* (1770); *Select Mechanical Exercises* (1778); *The Art of Drawing in Perspective* (1776). Most of his works were very popular.

FERGUSONITE, a rare mineral originally brought from Greenland by Giesecké, and named after Mr. Ferguson, of Raith. It has been since found at Ytterby, in Sweden. It has a brownish-black colour, with metallic lustre; is translucent, but in larger crystals is opaque. Specific gravity of the Greenland variety, 5.8; of the Swedish, 5.56. Opinions of chemists as to its true constitution have varied, it having been described at one time as a columbate (niobiate), and at others as a tantalate of yttrium, with varying amounts of other very rare elements.

FERGUSON, ROBERT, a Scottish poet of distinguished merit, was born at Edinburgh, October 17, 1750. He spent six years at the schools of Edinburgh and Dundee, and afterwards studied at the University of St. Andrews. He was at one time destined for the Church of Scotland; but he relinquished this idea, and became clerk in a law office. He wrote poems both in pure English and in the Scottish dialect, the latter being much superior to the former. His best productions display a rich fund of natural humour, keen powers of observation, and an excellent command of language. His conversational talents rendered his society highly attractive; a circumstance which proved detrimental to the poet. The excesses into which he was led impaired his feeble

constitution, and brought on disease, which terminated his existence October 16, 1774. He was buried in the Canongate Churchyard, Edinburgh, where Burns erected a monument to the memory of this kindred genius. His poems have been often printed.

FERINO, PIERRE MARIE BARTHÉLEMY, COUNT OF, a French general, born at Caravaggio in Lombardy in 1747; died at Paris, June 28, 1816. He was the son of an inferior officer belonging to the Austrian regiment of Bender. Having himself entered the Austrian army, he served in the Seven Years' war, and gradually rose to the rank of captain; but being unjustly treated by the Austrian government, he came to France in 1789, and on the 1st of August, 1793, he there obtained the rank of lieutenant-colonel, and afterwards in succession that of general of brigade (December, 1792), and that of general of division (August, 1798). He was deposed for maintaining discipline with too much severity; but was soon afterwards restored to his command, and being ordered to join the army of the Rhine and Moselle under Moreau, he took an active and distinguished part in the successes won at Landau and Bregenz, on the Lake of Constance, and in the Bavarian retreat. The courage which he displayed at the defence of the bridge of Huningen, and the combats which followed, procured for him the rank of grand-officer of the Legion of Honour (June 14, 1804) as well as the title of senator (February, 1805). Two years afterwards (1807) he received from Napoleon the rank of senator at Florence, and subsequently the government of the town and port of Antwerp. In 1808 he was made a count. Having voted for the deposition of Napoleon, Ferino received from Louis XVIII. the cross of St. Louis as well as letters of naturalization, which in consequence of the separation of Lombardy from France had become necessary in order to entitle him to sit in the new chamber of peers. The name of this general is written on the east side of the triumphal *Arc de l'étoile*.

FERISHTA, more properly Mohammed Kasim, an esteemed Persian writer, who lived in India towards the end of the sixteenth and the beginning of the seventeenth century, was a native of Asterabad on the Caspian Sea, and in his twelfth year set out for India with his father, who took up his residence in the Deccan, and was for some time employed as the tutor of a native prince. In 1689, having obtained court patronage, Ferishta formed the plan of a History of the Mohammedan Power in India. He used great diligence in collecting materials, and lived to complete the work, which continues to be the best yet written on the period which it embraces. The text of this work was published in a fine edition by Major-general John Briggs, assisted by Munshi Mir Khairat Ali Khan Mushtak, of Akberabad, under the title of *Tarikh-i-Ferishta, or History and Rise of the Mohammedan Power in India till the Year A.D. 1612* (Bombay, 1831). A translation of the first two books of this work, by Colonel Dow, appeared in 1770, under the title of a *History of Hindustan*; but a much more perfect and complete one, by Briggs, was published in London in 1829.

FERMANAGH, an inland county in Ireland, in the province of Ulster, surrounded by the counties of Donegal, Tyrone, Monaghan, Cavan, and Leitrim; area, 714 sq. miles, or 457,195 acres, of which about 14 per cent is in permanent pasture and about 10 per cent under corn and green crops. Fermanagh is divided lengthwise into two nearly equal portions by Lough Erne. The county generally exhibits a succession of abrupt eminences of slight elevation, but is mountainous towards its western boundary, the highest summit here, called Cullcagh, on the borders of the county Cavan, attaining an altitude

of 2188 feet. The soil is variable, and not remarkably fertile. Oats is the principal grain crop, and potatoes the principal green crop; flax also is grown to a large extent. Considerable numbers of cattle are bred on the high grounds. Most of the farms are under 10 acres. This county is better wooded than most others in Ireland. The chief timber grown consists of oak, ash, elm, beech, and fir. Coal and iron ore are found in small quantities, limestone in abundance. Manufactures unimportant, consisting chiefly of coarse linen for domestic use. The county is divided into eight baronies—Clanawley, Clankelly, Coole, Knockninny, Lurg, Magheraboy, Magherastephena, and Tyrkennedy. Principal town, Enniskillen. It returns two members to the House of Commons, being divided into N. Fermanagh and S. Fermanagh. Pop. (1841), 156,481; (1891), 74,037; (1901), 65,243.

FERMAT, PIERRE DE, one of the greatest masters of the higher mathematics, born near Montauban in 1601; died at Toulouse, January 12, 1665. He was engaged in his youth with his friend Pascal in very profound investigations as to figured numbers, on which he afterwards founded his calculation of probabilities, of which he may be considered the inventor. He also devoted particular attention to the general theory of numbers, and made many important discoveries in regard to it, far outstripping any of his predecessors; he squared the parabola in a much simpler way than Archimedes had done, and contributed greatly to the progress of geometry. His method of finding the greatest and least ordinates of curve lines is closely analogous to the method of the differential calculus, then unknown. His talents were not merely mathematical; he was well acquainted both with ancient and modern languages, and possessed a very extensive general knowledge. He carried on a keen controversy with Descartes, whose *Geometry and Optics* were at variance with his *Theoria de Maximis et Minimis*. Letters of his, written in 1636, prove that he was acquainted with the method of representing curves by equations before the publication of the *Geometry of Descartes*, hence M. Libri has declared that he shares with Descartes the honour of having invented the mode of applying algebra to geometry. His collected works were published after his death, under the title of *Varia Opera Mathematica* (two vols., Paris, 1679).

FERMENTATION (from Latin *fermentare*, from *fervere*, to boil), a term whose meaning has undergone considerable changes at different times in consequence of the progress of chemistry and biology. By the alchemists it was often used to describe any reaction accompanied by boiling or effervescence, even when purely inorganic, but among older meanings that which comes nearest to its present signification has reference to its use to describe such familiar but mysterious processes as the transformation of grape-juice into wine, the formation of alcohol from the saccharine fluids prepared from cereals, and the raising of the dough in bread-making. Closer examination has shown that these processes are only a few out of many of a similar kind, and now all such processes are included under the name fermentation. Fermentation may then be defined as including all chemical changes brought about in any substance through the agency, immediate or at least apparently immediate, of micro-organisms or of organic substances immediately derived from the vegetable or animal kingdom, these substances remaining essentially the same after the reaction as they were before it. The organism or substance which produces the fermentation is known as a *ferment*, and in accordance with the above definition ferments may be divided into two main groups, namely, (1) organized or formed

ferments, and (2) unorganised, unformed, or soluble ferments, usually called *enzymes* or *hydrolysts*. Both kinds are nitrogenous organic bodies of somewhat unstable character, and in both cases the amount of ferment required to transform a given amount of the fermentable substance is relatively very small. The organized ferments are, however, living bodies of microscopic size belonging to the groups of fungi and bacteria, and are therefore capable of growth and reproduction, while the enzymes are lifeless substances of definite chemical composition which can pass into solution. The action of the enzymes, accordingly, is often separated from that of the organized ferments and not included under the term fermentation, but the present state of our knowledge does not seem to offer sufficient warrant for such a course.

The enzymes or unorganized ferments play an important part in the vegetable and animal kingdoms. Thus, the solid, insoluble reserve-materials stored up in the seeds, roots, underground stems, and other parts of plants are by their means transformed into soluble substances capable of being diffused throughout the plant-body. These enzymes are of protoplasmic origin, and are complex chemical compounds of the proteid kind. The exact nature of their action is unknown, but all, or nearly all, produce their changes by a process known as *hydrolysis*, whence their alternative name of hydrolysts. The nature of hydrolysis may be best explained by citing a particular instance, the action of the enzyme *invertase* or *invertin* (see below) on cane-sugar. The molecule of cane-sugar under the influence of the ferment takes up a molecule of water, which becomes *fixed*, that is, incorporated with it, and then the combination resolves itself into the two simpler sugars, dextrose and levulose. The equation is as follows: $C_{12}H_{22}O_{11} + H_2O = C_6H_{12}O_6 + C_6H_{12}O_6$. The enzyme remains apparently unchanged, and a very small quantity of it seems capable of transforming an indefinite amount of the substance on which it acts. In one case, however, it has been proved that the enzyme forms a compound with the fermentable substance, and that the final products, including the enzyme, are then produced by the solution of this compound in water. This is probably the mode of action in all cases, and it is certainly much more intelligible than the former explanation by *catalytic* or *contact* action. The optimum temperature for most enzymes is between 30° and 50° C., and they are most active in the dark. The best-known enzyme is *diastase*, which is present in malted grain, and converts starch into maltose and dextrin. (See *DIASTASE*.) Other enzymes are: *invertase*, already referred to; *cellulase*, which acts chiefly on the cellulose of the cell-walls of grain and other seeds; *inulase*, which transforms inulin into levulose in various bulbs and tubers; *emulsin*, which decomposes the glucoside amygdalin of many rosaceous plants into glucose, benzoic aldehyde, and hydrocyanic acid; *pepsin*, found in gastric juice; *trypsin*, secreted by the pancreas; *zymase*, to which the alcoholic fermentation (see below) has been ascribed; and *urase*, to which the fermentation of urea into ammonium carbonate (see below) is primarily due.

The organized ferments, or micro-organisms concerned in fermentation, all belong to the group of cryptogamic plants known as Fungi, and their near allies the Bacteria. The most highly organized members of this group concerned in fermentation are some of the moulds, but their part in fermentation is of little importance, and we need not further consider them. We may therefore discuss the micro-organisms of fermentation under the two heads: (1) *Saccharomycetes*, or Yeast-Fungi, and (2) *Schizomycetes*, or Bacteria. The *Saccharomycetes* are minute unicellular plants of an oval shape, surrounded by a cell-

wall and containing granular protoplasm in which several vacuoles are conspicuous. They reproduce themselves by gemmation or budding, and by this means chains of cells closely resembling the hyphae of a mycelium are formed; but very few species develop any true mycelium, such as we find in the moulds and other fungi. If some of the cells be placed on a solid medium such as a slice of potato or a moist plate of plaster of Paris, from which little nutriment can be derived, the formation of two or four clearly-defined endospores will be noticed within each cell. The Bacteria, *Schizomycetes*, or *Splitting-Fungi*, are a very important group of microscopic cryptogams usually associated with the fungi. Their importance arises not only from the part they play in some well-known fermentations, but also from their wide-spread and beneficent activity in the order of nature, and from their less apparently beneficent action in producing several zymotic diseases in man and other animals. See *BACTERIA*.

The yeast-fungi cannot assimilate free nitrogen, but they can extract it from salts of ammonia and from various organic bodies. They can take up carbon from sugars, glycerol, tartaric acid, citric acid, acetic acid, ethyl alcohol, benzoic acid, phenol, and other organic bodies; but they can obtain their nutriment only in the presence of such substances as potash, lime, and phosphoric acid. Unlike nearly all the bacteria, the yeasts can live in acid media if the acid be not present in excessive quantity. The presence of free oxygen is very favourable to the growth of yeast-fungi, but under these conditions the transformation of sugar into alcohol greatly diminishes in vigour. If, however, free oxygen be excluded, fermentation proceeds vigorously. It was on this fact that Pasteur based his view of fermentation as, on the part of the yeast-plant, a sort of vicarious respiration. The optimum temperature for the growth of yeast-fungi is from 25° to 30° C., and they seem to be quite indifferent to light and electricity. Bacteria assimilate nitrogen most readily from peptone, but many other substances can also yield it. Carbon is most readily taken up from sugars, glycerin, tartrates, citrates, lactates, acetates, &c. Most bacteria are unfavourably influenced by light. In respect to temperature there is great diversity among the different species, some flourishing at 60°-70° C. and others at freezing-point, but for several of the best-known species the optimum temperature is 25°-35° C. The *obligate aerobic* forms cannot live in the absence of free oxygen, whilst the *obligate anaerobic* kinds are destroyed by the smallest trace of free oxygen. Between these two extremes we have *facultative aerobic* species, which are generally anaerobic but can tolerate some free oxygen, and *facultative anaerobic* species, generally anaerobic but able to live when the free oxygen is much diminished in quantity. Phosphoric acid, potash, lime, and similar bodies are also necessary to the life of bacteria.

The most important of all fermentations due to *Saccharomycetes* is that by which alcohol is obtained from sugar (the sugar itself being largely that derived from the starch of barley or other cereal), and it is in connection with this process that the subject has been most thoroughly studied. The species of fungus or yeast used in this process is known as *Saccharomyces cerevisia*, but of this two kinds are distinguished, namely, *top yeast* and *bottom yeast*. The former is used in top fermentation, which is carried on at a rather high temperature (15°-30° C.) and is rather violent, carbon dioxide being freely evolved and carrying the yeast to the surface. Bottom yeast is used in the slower bottom fermentation at about 4°-10° C., in which carbon dioxide is more gently evolved and the yeast therefore remains at the bottom. Bottom fermentation is chiefly used on

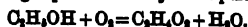
the Continent in the manufacture of lager beer. The sugars directly fermentable by this process are those with the formula $C_6H_{12}O_6$, namely, dextrose, levulose, and galactose. Cane-sugar ($C_{12}H_{22}O_{11}$) is first changed by an enzyme *invertase* (see above) contained in the yeast into dextrose and levulose, which are then fermented. The chief products of the fermentation are alcohol and carbon dioxide, but other bodies, such as glycerin, succinic acid, propyl, amyl, and other higher alcohols, are also produced. The process of fermentation continues until the alcohol forms about fourteen per cent of the solution, when the yeast-plant cannot continue its action any longer.

Many theories of alcoholic fermentation have been advanced. Before Cagniard Latour, Schwann, and others had established the organic nature of yeast, Stahl tried to explain the phenomena on a mechanical basis. Lavoisier, treating sugar as an oxide, thought that it was chemically resolved by fermentation into two other oxides, carbon dioxide and alcohol. When the organic nature of yeast was proved beyond doubt, the physiological theory was advanced, according to which the sugar is the food of the plant and the products of fermentation are its excretions. The celebrated chemist Liebig, however, contended that fermentation was a purely chemical process, and his later opinion has been in part reverted to by more recent observers. In 1876 Pasteur wrote: 'I have been inclined for a long time to consider fermentations, properly so called, as chemical phenomena correlative with physiological actions of a peculiar nature'. Pasteur proved conclusively that fermentation was bound up with the life of the organisms, but in what manner the vital energy of the yeast is exerted is still uncertain. Nägeli propounded a sort of physiological form of Stahl's mechanical theory, and Traube regarded the cells as centres for the production of enzymes, thus reducing fermentation by organized ferments to that produced by unorganized ferments. Traube's theory has gained considerable ground lately on account of the successful extraction from yeast by Buchner of an enzyme, *zymase*, which can produce all the phenomena of alcoholic fermentation.

Saccharomyces apiculatus and *S. pastorianus* take part in the fermentation by which wine is formed from grape-juice, but the chief micro-organism of the vinous fermentation is *S. ellipsoideus*. The elliptical cells of this species are found on the grapes and in the air of grape-growing districts, and fermentation is thus set up spontaneously without the actual addition of yeast. Recently, however, pure cultures of the wine-yeast have been prepared and used with very good results in the fermentation of grape-juice. *S. minor* is said to be the yeast used in raising the dough in bread-making. In recent times E. C. Hansen, an able Danish investigator, has added greatly to our knowledge of the chief yeast-fungi, and has prepared and thoroughly examined several pure cultures of the three most important species, *S. cerevisia*, *S. pastorianus*, and *S. ellipsoideus*. He has described six kinds in all, two belonging to the last species, three to the second, and the sixth to the first, the distinctions being founded on the temperature of spore-formation and the conditions under which a surface-film forms in a liquid medium. *S. cerevisia*, as we have seen, may be either a top or a bottom yeast. *S. pastorianus* I. is a bottom yeast which produces an unpleasant bitterness in beer, *S. pastorianus* II. is a top yeast found in beer, and *S. pastorianus* III. is a top yeast which produces cloudiness and other effects in beer. *S. ellipsoideus* I. is the true bottom yeast of the vinous fermentation, and *S. ellipsoideus* II. is a bottom yeast to which is due the cloudiness of turbid beer. Hansen has also cultivated two pure forms of brewers' yeast, known as

Carlsberg No. 1 and No. 2. Both are bottom yeasts, but the beer produced by No. 1. has less carbon dioxide than that of No. 2, and is used chiefly for bottling, the No. 2 beer being preferred for export.

Of the fermentations set up by bacteria only some of the most important can be referred to here. (1) *Acetic Acid Fermentation*. In this fermentation alcohol becomes oxidized into acetic acid, the total reaction being representable by the equation:



The microbe concerned in the fermentation, if allowed to continue its action, will oxidize the acetic acid into carbon dioxide and water. Two bacilli, namely, *Bacillus aceti* and *B. pasteurianus* have been described as taking part in this important fermentation, which is the basis of the commercial manufacture of vinegar from wine. (2) *Lactic Fermentation*. The souring of milk which has stood for some time is due to this fermentation, by which the milk-sugar becomes transformed into lactic acid through the agency of bacteria. Carbon dioxide is an invariable product of the fermentation. (3) *Butyric Fermentation*, often set up in milk which has undergone the lactic fermentation. (4) *Nitrification of Ammonia*, a process of vital importance in nature, by which organic nitrogen becomes fixed in soils as nitrates and nitrites. The process of decay and putrefaction, with the production of *ptomaines*, also belong to this section of the subject of fermentation.

See BREWING, WINE, VINEGAR, &c. Among treatises on the subject the following may be mentioned: A. Jörgensen, *Die Mikroorganismen der Gärungsindustrie* (4th edn., Berlin, 1898), translated into English by H. T. Brown as *The Micro-Organisms of Fermentation* (1899); Schützenberger, *Fermentation* (trans. 1882); Trouessart, *Microbes, Ferments, and Moulds* (trans. 1886); the article FERMENTATION in Thorpe's Dictionary of Applied Chemistry; &c.

FERMENTED LIQUORS, alcoholic beverages obtained by the fermentation and clarification of saccharine fluids. Such liquors have been in use as drinks in all countries from the earliest times. The commonest kinds of fermented liquors are *wines*, made from the juice of the grape, and all kinds of *ale* or *beer*, made from an infusion of malt. *Cider* is a fermented liquor made from apples; *perry*, from pears; *currant wine*, from currants; *mead*, from honey; *kumis*, made by the Kirghiz, from the milk of mares, cows, or goats; *chico*, from maize, by the South American Indians; *puisque*, by the Mexicans, from the juice of the American aloe (*Agave Americana*); and *palm-wine* is a fermented liquor made from the pith of some kinds of palms. From all fermented liquors a spirit may be extracted by distillation.

FERMENT OILS, oils obtained by macerating plants and allowing them to ferment in water, distilling the watery fluid, and extracting the oil with ether. Many plants have been treated in this way; for example, hemlock, plantain, centaury, horehound, nettle, &c. The oils are all volatile, generally with strong odour and taste, and they are quite different from the oils naturally contained in plants, and obtained by suppression or extraction.

FERMO (ancient, *Firmum Picenum*), a town in Italy, in the province of Ascoli Piceno, on a height, 32 miles S.W. of Ancona. It was founded by the Sabines before Rome existed; and has remains of old walls. It gives name to an archiepiscopal see, and has a cathedral, several other churches, a town-house, partly dating from the fourteenth century; collections of statuary and paintings. Its harbour is situated on the Adriatic, about 3 miles distant. Pop. 15,000

FERMOY, a town of Ireland, in the county of Cork, 22 miles N.N.W. of the city of Cork, on the Blackwater, here crossed by a magnificent bridge, erected in 1866. It is generally well-built. On the left bank of the river opposite to the town are infantry, artillery, and cavalry barracks, accommodating about 3000 men. There are here Fermoy College, St Colman's Roman Catholic College, two convents, and a handsome Roman Catholic cathedral. It has some large flour-mills and a brewery. Pop. in 1891, 6469.

FERNANDO DE NORONHA, an island in the Atlantic, full of mountains, which have the appearance of volcanoes, but are covered with verdure. It belongs to a small group of same name, about 210 miles from the coast of Brazil; lon. 32° 38' W.; lat. 3° 50' S. It is defended with forts. Viewed from the sea its most conspicuous object is a barren conical peak, about 1000 feet high. It is a place of banishment for male criminals; no females are permitted to visit the island. A scientific expedition was sent out by the British government in July, 1887, to investigate the group.

FERNANDO PO, an island in the Bight of Biafra, off the west coast of Africa, about 20 miles from the mainland, between lat. 8° 12' and 8° 47' N.; and lon. 8° 26' and 8° 57' E. It is of volcanic origin, and is of an oblong form, broadest at the south extremity, 35 miles long, and 22 miles broad. A ridge of mountains traverses two-thirds of its length, south to north, terminating in a magnificent cone, 11,040 feet high, called Clarence Peak, the summit of which is almost constantly enveloped in clouds. The whole appearance of this beautiful island is picturesque in the extreme, being covered to its highest elevations, on the north part, with dense forests and luxuriant vegetation, while on the south some fine park scenery compensates a comparative deficiency of trees. The latter consist chiefly of palms and the magnificent bombax, or silk-cotton tree, 'looking in the distance,' says Captain Allen, 'so like the white sails of vessels, hull down, that one might almost have supposed they saw a numerous fleet with canvas loosened to dry.' Many of these giants of the African forests measure 150 feet from the base to the first branch, and have, in the dry seasons, festoons of beautiful climbing plants pendant from the branches. The natives of Fernando Po, called Bubi, and by themselves Edeeyahs, are a peculiar race, and wholly different in their physical characteristics and language from their neighbours on the continent. Their appearance is by no means prepossessing at first, but, on further acquaintance, they are found to be a singularly amiable people, generous, hospitable, and of the most humane and kindly dispositions, brave, yet forbearing, and reluctant to spill the blood even of an enemy. There are several harbours in the island, the most spacious of which is Maidstone Bay, at the north-east end, where, in a creek or cove, is situated Clarence Town, where a settlement was established by the English in 1827. The island was first settled by the Portuguese, who, in 1778, ceded it to Spain. The settlement made in 1827 by the English, with the permission of the Spaniards, was afterwards abandoned, and since 1844 the island has remained in the undisputed possession of Spain. The pop. is estimated at 25,000.

FERNEX, or **FERNET**, a frontier town in France, in the department of Ain, 6 miles south-east of Gex, 1½ mile north of Geneva, in a beautiful locality, at the foot of the Jura, in a picturesque and fertile country. It is small, and its only manufactures are a few watches and some pottery. It is chiefly noted for having been the chief residence of Voltaire (who in fact founded it) from about 1760 to 1778, when he

quitted it a few months before his death. The house in which he lived is still standing, and the church, with the inscription, '*Deo creavit Voltaire*,' is now a farmhouse. Pop. (1896), 915.

FERNS (*Filices*), a natural group of the cryptogamous or flowerless division of plants, and forming the highest group of the acrogens or summit-growers. They are leafy plants, the leaves, or more properly fronds, arising from a rhizome or rootstock, or from a hollow arborescent trunk, and being droinate in vernation, a term descriptive of the manner in which the fronds are rolled up before they are developed in spring, having then the appearance of a bishop's crozier. On the veins of their lower surface, or their margins, the fronds bear small vessels named sporangia, containing spores. These spore-cases are arranged in clusters, named sori, which are either naked or covered with a layer of the epidermis, which forms an involucre or indusium. When the spores germinate they produce a cellular structure of a leafy description, called the *pro-embryo*, or *prothallus*, upon which are developed organs which have received the names of *antheridia* and *pistillidia*, from their being considered to represent stamens and pistils, the organs of reproduction in flowering plants. When produced upon the *prothallus*, these organs do not immediately give origin to a germinating spore; but from their mutual action proceeds a distinct cellular body, destined at a later period to develop into a fruit-bearing frond. This process, which is common alike to the production of ferns, horse-tails, club-mosses, pepperworts, mosses, and liverworts, is regarded as analogous to what has been termed the alternation of generations in some of the lower tribes of animals, as in the case of the *Acalephs* or *Medusæ*.

Ferns have a wide geographical range. They abound in tropical islands, and generally affect a moist insular climate. The herbaceous and shrubby kind are found towards the north and south poles. The tree-ferns rival the palms in the tropical forests, having trunks which sometimes rise to a height of 50 or 60 feet. Ferns constitute, along with lycopsids, the characteristic flora of New Zealand. The species of ferns, exclusive of varieties, in the Northern United States, amount to fifty-seven. The species in Great Britain, exclusive of varieties, number 41. British ferns are all comprised in the order *Polypodiaceæ*, and consist of the following genera: viz. 1, *Polypodium*, polypody; 2, *Allosorus*, rock-brakes; 3, *Gymnogramma*; 4, *Polystichum*, shield-fern; 5, *Lastræa*, buckler-fern; 6, *Athyrium*, lady-fern; 7, *Asplenium*, spleenwort; 8, *Scolopendrium*, hart's-tongue fern; 9, *Ceterach*, scaly fern; 10, *Blechnum*, hard-fern; 11, *Pteris*, bracken; 12, *Adiantum*, maiden-hair fern; 13, *Cystopteris*, bladder-fern; 14, *Woodia*; 15, *Trichomanes*, bristle-fern; 16, *Hymenophyllum*, film-fern; 17, *Osmunda*, royal fern; 18, *Botrychium*, moonwort; 19, *Ophoglossum*, adder's-tongue fern.

The uses of ferns bear a small proportion to their number in the vegetable kingdom. Several of them yield starch, and are employed as food. *Pteris esculenta* is the edible bracken of New Zealand. The *Adiantum capillus Veneris*, the true maiden-hair fern, is said to yield an astringent and aromatic secretion. Some of the American polypodies are esteemed for their medicinal properties.

FERONIA, one of the most ancient Italian goddesses, who presided over woods and orchards. The ancient grove, not far from Anxur (Terracina), was consecrated to her, and is very celebrated. Emancipated slaves received a cap in her temple as a badge of freedom.

FERRARA, formerly a signory, and after 1741 a duchy of Italy. It was held by the House of Este

as a Papal fief till 1597. (See ESTE.) In 1598 it was taken possession of by Clement VIII. as a vacant fief. In 1796 it was made part of the Cispadana, and in 1797 part of the Cisalpine Republic, and in 1802 it was included in the department of the Lower Po, in the Republic of Italy. In 1805 it formed part of the Kingdom of Italy, and in 1814 returned to the pope, with the exception of a strip to the north of the Po, which was assigned by the Vienna Congress to Austria, along with the right of maintaining garrisons in the towns of Ferrara and Comacchio. In 1860 it became, with the rest of Romagna, part of the present Kingdom of Italy, in which it now gives name to a province.

FERRARA, a celebrated city in the Kingdom of Italy, capital of the province of the same name, 26 miles N.W. Bologna, in a fertile but unhealthy plain, at a short distance from the north branch of the Po. It is a large and well-built town, with spacious and regular streets, and is inclosed by a wall 7 miles in circuit. It is defended on the west side by a citadel regularly fortified. In the middle of the city is a castle, flanked with towers, and surrounded by wet ditches, which was once the residence of the dukes, and is now that of the legate. Ferrara, though still retaining many traces of its former grandeur, has long been falling into decay; its pavements are overgrown with grass, and the staircases and balconies of many of its noble palaces are overrun with ivy, while others are without either doors or windows. The population has also fallen to one-fourth of its former amount. It has a cathedral and numerous churches, most of which contain valuable paintings, together with some interesting specimens of sculpture. There are here a public gallery of paintings, called the Palazzo del Magistrato, containing many excellent works by the leading painters of the Ferrara school; a school of medicine and jurisprudence, and a public library, containing about 100,000 volumes and 900 MSS., the latter including some of those of Ariosto and Tasso. The house in which Ariosto was educated, and that in which he lived during his latter years, and known by the names respectively of the Casa degli Ariosti and the Casa d'Ariosto, are shown to strangers. The latter is now national property, and is ranked among the national monuments. Another object of interest is the cell in the Hospital of St. Anna, in which Tasso was imprisoned. The house occupied by Guarini the author of the Pastor Fido—the Casa Guarina—is still inhabited by the marquises of that name. Ferrara is an archbishopric; the bishopric dates from 661; its archbishopric was founded by Clement XII. in 1735. It carries on some trade in corn and other produce of the soil. There are manufactures of silk ribbons, wax candles, and brazen utensils; tanneries and glass-works. The communal population in 1901 was 87,697.

FERREIRA, ANTONIO, one of the classic poets of Portugal, was born at Lisbon, 1528. He carried to perfection the elegiac and epistolary style already attempted with success by Sá de Miranda, and added to Portuguese poetry the epithalamium, the epigram, ode, and tragedy. His *Ines de Castro* is the second regular tragedy that appeared after the revival of letters in Europe. It was preceded only by Tristano's *Sofonista*. It is still considered by the Portuguese as one of the finest monuments of their literature, for its deep pathos and the perfection of its style. The works of Ferreira are not numerous, as his judicial office left him little leisure. He died 1599. His *Poemas Lusitanos* appeared complete at Lisbon, first in 1598, 4to, and *Todas as Obras de Ferreira* at Lisbon in 1771, two volumes.

FERRERI (*Muscula ferro*, Linn.) This little animal

is admitted by some naturalists as a distinct species, others, following Cuvier, regard it as only an albino variety of the common pole-cat (*M. putorius*). It is distinguished by having a sharp nose, red and fiery eyes, and round ears. The colour of its whole body is a pale yellow, somewhat resembling that of boxwood. It is a native of Barbary, though it is extensively naturalized in Spain, where it was introduced to rid that country from the multitudes of rabbits with which it was overrun. Its habits are similar to those of the other species of weasels. It is lively and active, and an inveterate destroyer of rabbits. If a dead rabbit be presented for the first time to a young ferret he will fly at it and bite it with great fury; but if it be alive he will seize it by the throat and suck its blood. Great numbers of these animals are imported into England and France for the purpose of driving rabbits from their burrows. In such cases they are muzzled, otherwise they would destroy the rabbits in their holes. They suck the blood of their prey, but seldom tear it. The ferret breeds in the last-mentioned countries, bringing forth from five to nine young; but it is apt to degenerate and loses its savage nature. The warreners in England use a crossed breed between this animal and the pole-cat. This hybrid is of a darker colour than the ferret.

FERRIER, JAMES FREDERICK, a distinguished Scotch metaphysician, born at Edinburgh in 1808; died at St. Andrews, June 11, 1864. He was educated at the Universities of Edinburgh and Oxford, after completing his course at the latter of which he entered upon the study of law, and was admitted a member of the Scottish bar in 1832. Finding literature a more congenial pursuit than that of law, he now began to contribute articles to Blackwood's Magazine, then at the height of its fame. The ability displayed in these contributions was so marked that when the chair of moral philosophy at the University of St. Andrews fell vacant in 1845, he was appointed to fill it. This post he continued to occupy for the rest of his life, although he was twice a candidate for a chair at Edinburgh. His chief work is entitled the *Institutes of Metaphysic*, in which he attempts to build up, according to a rigorously logical and deductive method, a complete system of knowing and being. The lectures he delivered at St. Andrews upon Greek philosophy were published posthumously in 1866.

FERRIFER, SUSAN EDMONSTON, a distinguished novelist, the aunt of the preceding, was born in Edinburgh in 1782. Her father was a writer to the signet, and at a later period a colleague of Sir Walter Scott as one of the clerks of session. Her life was chiefly spent in her native town, in the refined and literary society of which her tastes and abilities were trained. In 1818 she made her first appearance as an authoress by the publication of the novel of *Marriage*, which acquired great popularity, and is alluded to in the most commendatory manner by Sir Walter Scott at the end of the *Legend of Montrose*. The *Inheritance* appeared in 1824; and *Destiny*, or the *Chief's Daughter*, in 1831. These comprise all her works, but the comparative smallness of their number is amply compensated by their intrinsic merits. No one has succeeded better than Miss Ferrifer in depicting the manners of the upper middle class in Scotland at a time when the national peculiarities were still in a great measure intact, and had not as yet blended themselves into the social system of England. The management of her plots is conducted with great skill, so as to maintain an unflinching interest in the fate of the personages of the story; and the humorous powers with which many of the scenes are hit off, more especially in *Marriage*, remind the reader of some of Fielding and Smollett's most facetious de-

scriptions, without their grossnesses. In Sir Walter Scott's later days she was a frequent visitor at Abbotsford, where, by her sprightliness and conversational talents, she contributed greatly to cheer and enliven the depressed spirits of her host. She died at Edinburgh on 5th November, 1854. There is a short Life of Miss Ferrier in the edition of her novels published in 1881.

FERRO, or **HIERRO**, the most south-western of the Canary Islands, and the smallest of those which are inhabited; lon. of western extremity, 18° 9'. It is somewhat triangular in form (its form approximates to that of Sicily), and is about 18 miles long and 9 miles broad. It is a rocky, volcanic island, rising to the height of over 4600 feet, and presents numerous craters no longer active, besides a number of warm springs. It is by no means fertile, but good wine and brandy are made, and excellent figs are grown. The village of Valverde, in the north-east, is the chief centre of population. This island having once been supposed the most western point of the Old World, was formerly employed by all geographers as their first meridian, and the longitude was reckoned from it. For this purpose the longitude of Ferro was in France taken as exactly 20° west of that of Paris, though this meridian really passes some miles to the east of the island. German cartographers adhered longest to the meridian of Ferro in constructing their maps. Pop. (1897), 6184.

FERROCYANIC ACID. See **PRUSSIC ACID**.

FERROL, a town of Spain, in Galicia, in the province and about 12 miles N.E. of the town of Coruña, advantageously situated on the north side of a fine inland bay, connected with the sea by a narrow channel of same name. The bay forms one of the best natural harbours in Europe, and the narrow channel which leads to it is defended by the forts San Felipe and Palma. The town is also strongly walled, and is divided into Old Ferrol, the New Town or Centro, and Esteiro. The finest squares of the town are the Plaza de los Dolores and the Plaza del Carmen, and the Artisans' Club (El Liceo de Artesanos) is an interesting and important institution. The most remarkable building in Ferrol is the arsenal, an establishment of almost unrivalled magnificence, which employs some 4000 workmen, largely under English superintendence. The manufactures consist chiefly of swords, cutlery, and military and naval equipments, besides sail-cloth and leather. The sardine fishery is also important. The principal imports are coal, iron, timber, cotton, and grain; the chief exports are fish, iron, and vinegar. Pop. (1897), 35,975.

FERRY, in law, a right of maintaining a boat at a particular part of a river for the conveyance of people from the one side to the other. This right is originally one of the prerogatives of the crown, and can be enjoyed by a subject only by special grant or by prescription. The person who has a right of ferry is required to keep a boat or boats suitable for the conveyance of passengers, to charge a reasonable fare, and to provide the requisite landing-places on either bank of the river. A right of ferry does not exclude the proprietor of the land about the ferry from keeping a boat for his own private use, but no one will be allowed to establish a rival ferry so near the original one as to destroy its custom, and the holder of the original ferry has a right of action against any one who does so. Where no private right of ferry exists, the ferries are managed by some public body.

Ferry-boats are generally flat-bottomed, capacious boats, propelled by oars, or, where the water is shallow, by poles pushed against the bottom of the river. To prevent the boat being carried down the stream by the current there is sometimes a rope or chain stretched from bank to bank, by which the course

of the boat is directed, and where a rope is not used, the boat's head is directed obliquely up the stream, so that the boat is propelled upwards at a rate sufficient to balance the current downwards, and the result is that the boat crosses the river in a straight line. Steam ferries are now often used where the current is very strong and the traffic considerable. See also **FLYING-BRIDGE**.

FERRY, JULES FRANÇOIS CAMILLE, French statesman, was born at St. Dié, in the department of the Vosges, on April 5, 1832, and studied law in Paris. He soon became known as a journalist and pamphleteer, and in 1865 he joined the staff of *Le Temps*. In 1868 he issued a pamphlet entitled *Les Comptes Fantastiques d'Hausmann*, containing a very happy criticism of the government expenditure on the rebuilding of Paris, and in the following year he was elected to the Corps Législatif as one of the members for Paris. In the house he soon established a reputation as an able speaker on the side of the opposition, and with a few colleagues used his influence to prevent the disastrous war of 1870. He became a member of the Government of National Defence, of which on September 5 he was appointed secretary. On September 6 he was entrusted with the administration of the department of the Seine, and on November 15 he succeeded M. Arago in the central mayoralty of Paris. In February, 1871, the department of the Vosges elected him deputy, and in May of the same year M. Thiers appointed him prefect of the Seine, a post which he held only a few days. In 1872-73 he was ambassador at Athens, but on MacMahon's accession to power he again sat on the opposition benches and played a prominent part in parliamentary life. In 1879, when holding the office of minister of public instruction, he introduced a bill for the exclusion of members of unauthorized religious bodies from all teaching posts, but though it passed the Chamber it was rejected by the Senate; and in 1880 a second attempt to carry it met with the same fate. The main object of the bill, however, the expulsion of the Jesuits, was effected by the use of laws which had become obsolete. This caused the break-up of the ministry, and M. Ferry then became head of a new cabinet, which retained office only till 1881. His second premiership began in 1883, and was characterized by a vigorous policy of colonial expansion. The invasion of Tonkin was very unpopular, and led to the downfall of his ministry in 1884. He unsuccessfully sought election to the office of president after M. Grévy's resignation, and from that time till his death, on March 16, 1893, he took very little part in political controversy. His *Discours et Opinions*, in seven volumes, was edited by Robiquet in 1893-98.

FERRYPORT-ON-CRAIG. See **TATFOOT**.

FERTÉ-SOUS-JOUARRE, LA, a town of France, department of Seine-et-Marne, pleasantly situated on both sides of the Marne, here crossed by a stone and an iron bridge, 37 miles N.E. of Paris, well built, possessed of a handsome chateau, a ruinous old castle, excellent quarries of millstones, which are largely exported, several manufactures, and a trade in corn, flour, and cattle. Pop. (1896), 3738.

FERTILIZATION, in biology, the process through which, in sexual reproduction, the male and female elements come in contact and combine, thus enabling the ovum or ovule to develop into a distinct individual under favourable conditions. See **REPRODUCTION**.

FERTILIZERS, a general name given to manures, but more especially to artificial manures. See **MANURE**.

FERULA, a genus of umbelliferous plants, whose species often yield a powerful stimulating gum resin, employed in medicine. The species are natives of

the shores of the Mediterranean and Persia, and are characterized by tall-growing pithy stems, and deeply-divided leaves, the segments of which are frequently linear. *F. communis* of English gardens is called giant fennel. *F. orientalis* and *F. tingitana* are said to yield African ammoniacum, a gum resin like assafetida, but less powerful.

FESCENNINE VERSES (probably so called from the Etruscan town *Fescennium*), in the history of the Roman literature, rude verses in the form of a dialogue between two persons, who satirized and ridiculed each other's failings and vices; also a sort of dramatic poem, perhaps extemporaneous. They originated in country districts in ancient Italy, but were ultimately introduced into the towns, and even into Rome, and formed a favourite amusement at marriages and on other occasions of festivity. The practice, at first harmless, latterly led to too great licence of speech, so that the indulging in this amusement had to be restrained by the law. The amusement is still common in Italy.

FESCH, JOSEPH, Cardinal and Archbishop of Lyons, and brother on the mother's side of Napoleon's mother, was born at Ajaccio in 1763. He had devoted himself to an ecclesiastical life, but quitted it on the outbreak of the French revolution, and became commissary of war to the army of the Alps. He held the same office in 1796 under his nephew in Italy. After Bonaparte in 1801 concluded the concordat with Pius VII. he resumed his ecclesiastical status, and became in 1802 Archbishop of Lyons, and next year a cardinal. He was likewise appointed French ambassador at Rome, and made himself very acceptable to the pope by his ultramontane tendencies. He accompanied him in 1804 to Paris for Napoleon's coronation, became grand almoner of the empire, count, and senator, and in 1806 was appointed coadjutor and successor to the prince primate of the Confederation of the Rhine. In 1809 Napoleon wished to make him Archbishop of Paris, but the appointment did not take effect, as he had long been at variance with his nephew in regard to his policy toward the Papal see. He then retired to his see at Lyons, where he lived in a kind of brilliant exile. On the approach of the Austrians in 1814 he fled with his sister, Madame Bonaparte, to Rome, where the pope received him with open arms. Napoleon's return brought him back to France, and he acted as a peer during the Hundred Days, but the battle of Waterloo sent him back to Italy. When called upon by the Bourbons to resign his episcopal rights he decidedly refused, but in 1825, after a Papal brief interdicted him from exercising spiritual jurisdiction, he renounced the office, but retained the dignity. He died at Rome in 1839. His very extensive collection of paintings, more numerous, however, than select, was disposed of by auction.

FESCUA, the popular name of a genus of grasses (*Festuca*) nearly related to the genus *Bromus*, having several-flowered spikelets arranged in panicles. The meadow fescue (*Festuca elatior*, var. *pratensis*) is a fibrous-rooted perennial, growing from 2 to 3 feet high in low meadows and pastures, where it forms fresh herbage among the earliest of the native British grasses. The panicle is narrow, and consists of several lateral branches, bearing from three to five erect spikelets each, in addition to one which stands in the axil of every branch. The hard fescue (*Festuca duriuscula*) is a native of dry sandy places, in which it spreads rapidly by means of its creeping roots. The leaves next the roots are very narrow, almost thread-shaped, rough, with fine points, arranged in two rows on the numerous suckers, which this plant throws up in all directions. The stem grows to the length of $1\frac{1}{2}$ or 2 feet, and ter-

minates in a close, rather one-sided panicle. The red fescue (*Festuca rubra*) serves, like the preceding species, to bind loose soil, and is also a good hay grass. The sheep's fescue (*Festuca ovina*) is much smaller than the hard fescue, not usually growing more than 5 or 6 inches high when in flower. Of this *Festuca tenuifolia* is a longer-leaved, bright-green variety. The tall fescue (*Festuca arundinacea*) is a coarse reedy grass, found commonly in low swampy situations. It has broader leaves than meadow fescue; and its stems grow 4 or 5 feet high. Another tall species is the giant fescue (*Festuca gigantea*), which occurs in shady woods and similar situations.

FESSE, or **FESS**, in heraldry, one of the so-called honourable ordinaries, being a band crossing the shield horizontally. The *fesse point* is exactly in the centre of the shield. See **HERALDRY**.

FESTINIOG, or **FRESTINIOG**, a parish, village, and town of N. Wales, in Merioneth, about 10 miles N.E. of Harlech. This locality has been long a resort of tourists on account of its fine scenery, and it is also famous for its slate-quarries. The village is beautifully situated on a hill, and near it are fine waterfalls on the Cynfael. The town of Festiniog or Blaenau Festiniog is of modern origin, having grown up around the slate-quarries a few miles from the village. Pop. (1901), 11,485.

FESTIVALS. The consecration of certain days or longer periods to particular celebrations either in honour of some god, or in commemoration of some important event, is a practice which has prevailed among nearly all nations, both ancient and modern. On this account it is impossible to notice here any but the best-known festivals of the leading nations and religions. To begin with those of the Jews, there are six festivals mentioned in the Bible as of divine origin, and hence called in Scripture *moedim* or sacred feasts. These are the weekly feast of the Sabbath, the feast of Unleavened Bread or the Passover, Pentecost or the feast of Weeks, the feast of Trumpets or New Moon, the feast of the Day of Atonement, and the feast of Tabernacles. There were other two feasts, not of divine origin or religious obligation, being established in later times. These were the feast of Purim (commemorating the failure of Haman's machinations) and the Dedication of the Temple (after its profanation by Antiochus Epiphanes). The ancient Egyptians had numerous festivals in honour of their various deities, but none of sufficient importance to deserve separate mention. The Persians celebrated three festivals of victory, and three festivals of liberty. The former were in commemoration of important events in the national history; and the latter had reference to the future triumph of Ormuzd or the good principle over Ahriman or the principle of evil. Among the ancient Greeks were celebrated the Dionysia, in honour of Dionysus; the Eleusinia, in honour of Demeter; the Panathenaea, a festival instituted by Theseus in honour of Athena, the tutelary goddess of Athens, and celebrated by all the tribes of Attica, the union of which it was intended to confirm and cement. Besides these there were the four great national games, celebrated at various intervals by all the Greeks—the Olympic, the Isthmian, Nemean, and Pythian Games. Among Roman festivals were the Saturnalia, Ambarvalia, Cerealia, Lupercalia, Liberalia, and others held in honour of different gods and heroes. There were besides these the Decennalia or Decennia, held every ten years, under the Roman emperors; the Ludi Seculares, said to have been held once in every century; and the *Feria Latina*, intended to commemorate the union of the Latin tribes.

The festivals of the Christian church owe their origin partly to those of the Jewish religion, such as Easter, which corresponds to the Passover of the Jews, and Whitsunday, which corresponds to Pentecost; partly also to pagan festivals, which the Christian hierarchy, finding it impossible to abolish them, applied to Christian uses by converting them into festivals of the church. They were instituted at various periods in the history of the church, sometimes by Papal decrees, sometimes by general councils, sometimes by national councils. These festivals are divided into movable and immovable; the former those which in different years fall on different days; the latter those which always fall upon the same day. The chief of the movable feasts is Easter, the one on which the position of all the others, except that of Advent Sunday, depends. (See EASTER.) Septuagesima Sunday falls nine weeks before Easter, Sexagesima Sunday eight weeks, Quinquagesima Sunday seven weeks, the first Sunday in Lent six weeks, and Palm Sunday one week before Easter, and Rogation Sunday falls five weeks, Ascension Day forty days, Whitsunday seven weeks, and Trinity Sunday eight weeks after Easter. Ash Wednesday is the Wednesday before the first Sunday in Lent, Maunday Thursday the Thursday, and Good Friday the Friday before Easter, and Corpus Christi is the Thursday after Trinity Sunday. Advent Sunday is the nearest Sunday to the feast of St. Andrew, November 30, whether before or after. The chief immovable feasts are the feast of the Circumcision on the 1st of January, Epiphany on the 6th of January, the Annunciation of the Blessed Virgin on the 25th of March, the Transfiguration of Christ on the 6th of August; the feast of St. Michael and All the Angels on the 29th of September, the feast of All-Saints on the 1st of November, the festival of All-Souls on the 2d of November, and Christmas Day or the feast of the Nativity of our Lord on the 25th of December. The worship of the Virgin Mary began in the fifth century, at the time when the expression *theotokos* (God-mother), being opposed by Nestorius, and sanctioned by the Council of Ephesus (431) and that of Chalcedon (451), acquired a peculiar importance. The expression itself was already of long standing. The origin of this worship is enveloped in darkness. The festivals relating to the Virgin Mary in the Catholic Church include: the feast of the Annunciation; the Purification of the Virgin, or Candlemas; the feast of the Visitation of Our Lady; the feast of the Immaculate Conception; the Nativity of the Virgin; the Martyrdom of the Virgin Mary; the Assumption of the Virgin (Aug. 6); and several smaller ones. On the 2d of November the festival of All-Souls is observed in the Catholic Church as a day of mourning and commemoration of such of the dead as are not yet admitted to the contemplation of their Maker. The 29th of September is the festival of St. Michael (Michaelmas), which is kept as a general festival in honour of the angels, and may be considered partly as a commemoration of the victory of the good principle over the bad, and partly as a children's feast. August 6 is the festival of the Transfiguration of Christ, which was celebrated with great rejoicing, particularly among the Greeks. The worship of the cross has introduced two festivals: that of the Invention of the Holy Cross (May 3), and that of the Exaltation of the Cross (September 1). The festivals in commemoration of the apostles, the evangelists, and all the other saints also belong to the class of immovable feasts. The days that are still held as festivals, and have religious services connected with them in the Church of England, are called *red-letter days*, because they are often printed with red letters in the church calendar.

dar; while the days that have no services connected with them, are called *black-letter days*, because printed in black letters. The former are commonly known also as the *major festivals*, the latter being the *minor*. The major have proper collects, epistles, and gospels set down for them in the Prayer Book, while the minor have not. Some of the festivals of the Roman Church, such as All-Souls, Corpus Christi, and several in honour of the Virgin, are not held in the Church of England. The following list of major festivals may be given, taking them in the order in which they stand in the Book of Common Prayer: Advent, Christmas, St. Stephen, St. John the Evangelist, Innocents, Circumcision of Christ, Epiphany, Ash Wednesday, Good Friday, Easter, Ascension, Whitsunday (Pentecost), Trinity, St. Andrew, St. Thomas, Conversion of St. Paul, Purification (Presentation of Christ in the Temple), St. Matthias, Annunciation, St. Mark, St. Philip and St. James, St. Barnabas, St. John the Baptist, St. Peter, St. James, St. Bartholomew, St. Matthew, St. Michael and All-Angels, St. Luke, St. Simon and St. Jude, All-Saints.

When the national convention of France had, in 1793, on the motion of Robespierre, acknowledged the existence of a Supreme Being and the immortality of the soul, and dedicated a national festival on the twentieth of Prairial to the Deity, the following festivals, to be kept on the decade days of the republic, were also instituted—1, Of the Supreme Being and nature; 2, of the human race; 3, of the French nation; 4, of the benefactors of mankind; 5, of liberty and equality; 6, of the martyrs of liberty; 7, of the republic; 8, of the freedom of the world; 9, of the love of country; 10, of the hatred of tyrants and traitors; 11, of truth; 12, of justice; 13, of modesty; 14, of fame and immortality; 15, of friendship; 16, of temperance; 17, of heroism; 18, of constancy; 19, of disinterestedness; 20, of stoicism; 21, of love; 22, of conjugal fidelity; 23, of filial affection; 24, of childhood; 25, of youth; 26, of manhood; 27, of old age; 28, of misfortune; 29, of agriculture; 30, of industry; 31, of the forefathers; 32, of posterity and felicity. (In the preceding article nothing but the names of the different festivals is given, as separate articles will be found on the more important of those mentioned.)

FESTOON, in architecture, an ornament representing a garland of fruits, flowers, &c., attached at the two ends, and hanging in the middle. It is chiefly used to adorn the friezes of buildings in the Ionic or Corinthian style; and on antique vases, altars, and articles in terra cotta it is not unusual. In modern art this ornament was very skillfully used by Giovanni da Udine, the contemporary of Raphael, as well as by Arthur Quellinus in his decoration of the interior of the town-house at Amsterdam.

FESTUS, SEXTUS POMPEIUS, a Roman grammarian belonging to the third or fourth century of our era, author of an abridgment of a work by Verrius Flaccus, called *De Verborum Significatione*, a kind of dictionary, which is very valuable for the information it contains about the Latin language. The work of Festus was still further abridged in the eighth century by Paulus Diaconus, whose abridgment was printed for the first time in 1471. The original work of Festus has been preserved in only one MS., and that in a very imperfect condition, which belonged to the library of Cardinal Farnese, and is now preserved at Naples. The edition of the work of Festus by K. O. Müller (Göttingen, 1839), which was prepared with the help of this manuscript, quite superseded all those that had previously been published without its assistance. The chief editions previous to that of Müller are those of Scaliger, Dacier, and Lindemann.

FETICH, or **FETTER**, a word first brought into use by De Brosses, in his work *Du Culte des Dieux Fétiches* (1760), and derived from the Portuguese *feticão*, a charm. The Portuguese gave this name to the idols of the negroes on the Senegal, and afterwards the word received a more extensive meaning. A fetich is any object of nature which is regarded with a feeling of awe, as having mysterious powers residing in it. The fetich may be animate, as a cock, a serpent, a panther, or any other animal; or inanimate, as a river, a tooth, a shell. Fetich worship prevails in Guinea, and other parts of the west coast of Africa. It is usual for each tribe to have a fetich in common, but in addition to the common fetich every individual may have one of his own. To this he offers up prayers, and if they are not heard he punishes it, or perhaps throws it away, or breaks it in pieces.

FÉTIS, **FRANÇOIS JOSEPH**, a Belgian musical composer and writer on music, born at Mons, March 25, 1784; died at Brussels, March 27, 1871. He was educated at the Paris Conservatoire, and in 1813 was appointed organist of St. Pierre at Douai. In 1818 he came to Paris, and was a professor in the Conservatoire there from 1818 till 1833, when he was appointed director of the Conservatoire at Brussels. In 1864 he was appointed an officer of the Legion of Honour, and in 1869 grand officer of the order of Leopold. Among his works may be mentioned *Traité de la Fugue et du Contrepoint* (1825); *Biographie universelle des Musiciens* (1835-44); *Manuel des jeunes Compositeurs des Chefs de Musique militaire et des Directeurs d'Orchestre* (1837); *Traité complet de la Théorie et de la pratique de l'Harmonie*. His musical compositions include operas, sacred music, and instrumental pieces for the piano and the violin. In 1827 he founded the *Revue musicale*, which he continued to edit till 1835.

FEU, **FEU-HOLDING**, in Scottish law, a holding by which the vassal enjoys his right of property in consideration of a payment either in money, grain, or agricultural services to his superior. It was anciently deemed an ignoble tenure, in contradistinction to ward-holding, where the services rendered were purely of a military kind; and blench, where they are merely nominal. It is now the most common tenure by which landed, and more especially house property, is held in Scotland.

FEUDAL SYSTEM. A fee, feud, or fief is a possession, of which the vassal receives the right of use and enjoyment, of disposition and alienation, on condition of fidelity, that is, of affording assistance or counsel, and avoiding all injurious acts, together with the performance of certain services incident to the tenure, while the feudal lord still retains a paramount right (*dominium directum*). A fief is distinguished from allodial possessions by the circumstance that it cannot be alienated without the consent of the feudal lord, by the services usually due from the vassal, and by a peculiar kind of inheritance. The system originated among the German tribes, and the nature of feudal property is explained by its origin. Such was the passion of the ancient Germans for war, that in time of peace private feuds took the place of public contention; and in default of these the men of military age spent weeks and months and years in adventures, and made incursions into the territory of the neighbouring tribes, or took part in the quarrels of the distant ones. On these expeditions the experienced and powerful were usually attended by a number of equally valiant youths, who were furnished by the chief with provisions, and perhaps with arms, and composed his retinue or *following* (Latin, *comitatus*). This retinue, which was well known in the time of Cæsar and Tacitus,

was bound to the commander by firmer ties than the transient love of war or inconstant success. If the leader did not prove false (which was never known), the attendant devoted his whole life to his service, and was always ready to meet the summons to new adventures. And when the whole nation marched to war, the warriors formed about their chieftain a devoted band ready to sacrifice themselves for his safety. Each of them looked upon the life and liberty of his leader as intrusted to his own peculiar care; and if any one survived his imprisonment or death, he was for ever branded as a coward. The general of the national militia (*Heerbann*), always one of the wealthiest landholders, had a crowd of them constantly about his person. These companions (German, *Gesellen*, whence some derive the Low Latin word *vasallus*) received no pay except their arms, horses, and provisions, and the portion of the spoils which remained after the chieftain had taken his own share. In the expeditions of particular adventurers against the adjacent tribes or the Roman provinces, their booty consisted of garments, arms, furniture, slaves. But when the northern hordes broke into the south, and in the partition of the conquered lands large districts fell into the hands of kings or dukes and their subordinates, they gave certain portions of the territory to their attendants to enjoy the possession for life. These estates were called *beneficia* or fiefs, because they were only lent to their possessors, to revert after their death to the grantor, who immediately gave them to another of his servants. From this custom of the ancient Germans arose the feudal system and feudal service, which is purely German.

As the son commonly esteemed it his duty, or was forced by necessity, to devote his arm to the lord in whose service his father had lived, he also received his father's fief; or rather, he was invested with it anew. By the usage of centuries this custom became a right; and to deprive one of his paternal fief, though it was prohibited by no law, seemed an act of injustice. This change took place between the ninth and eleventh centuries. A fief rendered vacant by the death of the holder was at once taken possession of by his son, on the sole condition of paying homage to the feudal superior. In the case of ecclesiastical fiefs the right of succession belonged, under the same condition, to those who succeeded the last holders in their ecclesiastical office. In that period of lawless violence which followed the migration of nations and the death of Charlemagne, it soon appeared useful and indispensable that those states which were well protected from foreign invasion, though they had no assurance of internal security, should put themselves under the protection of a powerful governor. Powerful barons and rich bishops on one side, dukes and counts, the representatives of the kings, on the other, oppressed the neighbouring free proprietors of landed property till they looked with envy on the dependent vassals, and submitted to the protection of the oppressor, or some other nobleman, in order to obtain security. Many persons, especially the poor, who were obliged to cultivate their land themselves, and could not leave it without much inconvenience, submitted to this protection, though they were in no danger of oppression, merely to escape the military service. For dukes, and counts, and the bailiffs (who acted on behalf of the bishops), whose duty it was to levy and command the army, instead of employing the raw militia, who often forgot their military skill in long-continued peace, preferred their own vassals, and released such of the king's subjects as were willing to become their vassals and pay a certain contribution from the obligation of serving in the national militia. The con-

perors and kings cared little from what source the dukes obtained their forces, provided the number was complete. Besides the advantages just mentioned they even preferred an army of vassals to the national soldiery, because the latter were bound only to serve in the defence of the country, while the former were bound to a much less limited, sometimes unconditional service, and were hence far more useful. Thus the national militia gradually went out of use, and gave place to the feudal militia. Another, and not a small class of men, including the wealthy families, afterwards called the *inferior nobility*, who cultivated their land by means of hirelings or bondsmen; were not anxious to free themselves from the military service, for war was always their favourite employment. But they could not dispense with the protection of the nobles; on the other hand, their pride could not stoop to serve in an army which was every day sinking into disgrace. They longed for the honour of being received among the vassals of the nobility, and consented to hold their estates as the feudatories of the nearest duke, or earl, or bishop. Often, too, from a feeling of devotion, they became the feudatories of the great religious establishments.

All vassals were bound, under the penalty of losing their lands, to follow their lord in all his quarrels against any person excepting other lords of whom they held lands, and excepting also the emperor and empire. Moreover, in war the vassals were required to throw open their fortresses and castles for the use of their masters. The dukes and counts and bishops, who were paid in fiefs for their several services, stood in this relation to the emperor; and inferior landed proprietors stood also in the same relation to the superior nobility (for this was the origin of the inferior nobility). Rich and adventurous peasants likewise, who preferred honourable vassalage to honest but despised patronage, invested some nobleman with their lands, or were invested by him, with the consent of the lord paramount, with a further portion of his feudal territory (under tenants). The investiture was made, from the time of the Saxon emperors, in the great vice-regal fiefs by a banner (which was the ensign of command); in the inferior ones by a sword; and in the spiritual fiefs by a ring and a staff; after the Concordat of Worms in 1122, which confined the power of the emperor to secular affairs, by a sceptre. The *castle-fiefs*, so called, were a peculiar kind of military fiefs, the possessor of which was bound to defend the castle belonging to his lord. The vassal who directed the defence was called, in the imperial fortresses, a *burggrave*. Thus the several orders of vassals formed a system of concentric circles, of which each was under the influence of the next, and all moved around a common centre, the king, as the supreme feudal lord.

With military vassals another class arose. From the oldest times we find in the courts of kings and the governors whom they appointed, as well as in those of the bishops, certain officers who at first performed active service, but were afterwards rather a splendid appendage to the court. The four offices of the marshal, the chamberlain, the cup-bearer, and the sewer, are the oldest and most honourable, but by no means the only ones; offices, on the contrary, were as numerous as the employments which could be devised at court. These officers, at a period when money was scarce and the old German notion in full vigour which considered none but landed proprietors as citizens, and none but the owners of large estates as noblemen, were naturally rewarded by grants of land during the time of service; and these estates, like the military fiefs, but somewhat later, certainly not before the time of Frederick I. (1152-90), became by degrees hereditary. The splendour of the

court, and the advantages accruing from these services, induced many noblemen to solicit them. They became the first in the new class of servants or ministers which was thus formed; and under them there was a multitude of other servants, particularly on the estates of the nobility. Every farmer (*villan*) was paid for the cultivation of one piece of land by the investiture of another smaller piece; and there was scarcely a servant of the court who had not been invested for his services with at least a house or a garden in the village adjoining the castle. The great ministerial officers, too indolent to execute the duties of their offices themselves, with the permission of their lords soon began to commit them to others, whom they paid in like manner for their administration by the investiture of some other estates. Fiefs were gradually introduced which were acquired not by military or court services, but by performing certain duties of no great difficulty, amounting to little more than the acknowledgment of the lord's feudal superiority, as by the yearly gift of a horse, a pair of hounds, a falcon, or the like. Very slight acts were often admitted as acknowledgments, as the holding of a stirrup or walking before the feudal lord on certain occasions. Among the presents and acts are some of a most ridiculous character, according to the humour of the feudal lord: such as dancing before the army, performing some trick, offering an egg, a penny, &c.

A refusal to perform feudal service, or any other violation of fealty, was styled *felony*. Upon this and other difficulties incident to feudal property, as in cases growing out of the succession, surrender, alienation, or under-tenure of a fief, the lord decided in a feudal court, filled by vassals, who were required to be of equal rank with the accused. To appear in these courts at the summons of the lord of the manor, and accept the place of an assessor there, was reckoned among the duties incident to a fief. As the relation of lords and vassals (at that time one of the most important relations in life) became more and more widely spread, and the number of vassals increased at the expense of the ancient immediate subjects of the empire, the latter were thrown into the back-ground, and at length nearly forgotten.

In the tenth and eleventh centuries no duty due from subjects was known except feudal duties; the whole German Empire was one vast feudal possession, and the ideas of feudal lords and national sovereigns were wholly confounded. If any one was neither a lord nor a vassal he was scarcely looked upon as a citizen, and no one took care for his safety. Hence few rich landed proprietors ventured to rely upon their own strength, without a feudal connection. And even most of these at last yielded to the spirit of the age, and became royal vassals (as the lords of Brunswick and Hesse, and the counts in Thuringia, at that period called *dukes* and *landgraves*). The emperor, likewise, used every means to induce them to adopt such a course. Thus, when the haughty Baron of Krenzingen, who was the vassal of no one, refused to do homage to Frederick I., the enraged monarch invested him with the right of episcopate, that he might become his lord. On the other hand, it was considered the duty of the German emperor, not to extinguish a fief which reverted to the sovereign for want of heirs to inherit it, but to bestow some other person (though the selection depended entirely on the pleasure of the monarch), and thus to secure the continuance of the feudal system, on which the continuance of the empire seemed to depend; for a reversion of fiefs to the emperor would bring into his hands an excess of power; and a release of the princes from their feudal ties would be followed by a state of anarchy. Besides, the necessary connection

of all the offices with the fiefs rendered the line of separation between them very indistinct; and the service which was paid for a fief was regarded as the fief itself; so that persons were no longer invested with estates as the reward of office, but with the office, as a productive capital, on account of the property attached to it. The dukes, bishops, bailiffs, and burgraves, sometimes from ignorance and sometimes from interested motives, increased this confusion. They made no difference between their fiefs and the districts and castles for the government of which they were given to them. They exercised in those places, which were filled mostly by their own vassals, the power of feudal landlords, and esteemed any attempt to curtail their rule as an act of flagrant injustice, equivalent to a withdrawal of the fief. In the provinces where the ducal power was early abolished, as in Franconia, Suabia, and Westphalia, the counts and abbots took the same course; while in Bavaria, Mania, Thuringia, Austria, and Brandenburg, often wholly forgetful of their dignity as imperial governors, they sank into the state of mere vassals to the dukes, landgraves, and margraves, and were hardly able to maintain their under-tenures in a state of dependence.

From the feudal system, the only social organization of the European states in the middle ages, a new system of civil rank arose. The inferior nobility, a rank intermediate between the higher nobility (princes) and freemen, owes its origin, it is said, to this institution; and a regular scale of rank was formed among the vassals, without detriment, however, to the principle of equal birth. The king formed the first class; the spiritual princes, bishops, and immediate abbots constituted the second; the lay princes, dukes, landgraves, margraves, and immediate counts, the third; those barons, or rich landed proprietors, who owed fealty to no one, but yet, on account of their limited rights or possessions, were the vassals of the emperor, the fourth; those freemen who stood in the same relation to the princes, the fifth; the vassals of the former and the servants of the princes, the sixth; and the possessors of small fiefs, the seventh. This arrangement partly corresponds to the Italian division into *principes*, *capitanei*, *valvasores majores*, *valvasores minores*, *valvasini*, and *soldati*; the English into lords, esquires, and freeholders; the Spanish *grandees* (*ricos hombres*, rich men), *esoueros*, *hidalgos*; and the French *pairs*, *barons*, *cuyers*, and *valvasseurs*. The title *cuyers*, *esoueros*, *esquires*, however, belongs rather to chivalry. Besides these ranks, after some centuries, the order of citizens was formed, as being included under no one of them. The spirit of the feudal system, grounded on the prevalence of landed property, was necessarily foreign to cities which owed their origin to industry and personal property, and founded thereon a new sort of power. Hence we see them frequently involved in open hostilities and contests with the nobility.

The principles of the feudal laws were developed and established by the Lombard lawyers of the twelfth century. The collection of feudal laws and customs which is appended to the Roman code under the title of *Libri Feudorum* became the code of feudal law over a great part of Europe. The north of Germany, Denmark, Prussia, Poland, &c., held by the old German feudal code, which differs from the Lombard code chiefly in not acknowledging the right of collateral relations, as such, to succeed to a fief; and in grounding the right of feudal succession, not on descent from the first possessor of the fief, but only on community of possession; so that division destroyed the right of inheritance. In place of this community similar force was given since the twelfth century in the above-mentioned countries to a merely formal

union, instituted in the first investiture, and preserved and renewed in all cases of division or death (joint investiture).

The feudal form of government, at a period when a spirit of independence and of opposition to despotism was abroad in the land, was well suited to put into the hands of one governor, as supreme feudal lord, the reins of the national power, to be employed against foreign enemies without endangering domestic freedom. But the purity and influence of feudal relations in time became less; and the strength of the national government declined amidst a spirit of disaffection and sedition, which became universal when nobles began to perceive that the feudal government was not naturally dependent on kings, but kings on it. Indeed, the sovereigns had no other security for their subjection than the feudal oath and the menaces of punishment, which the king might not have the ability to carry into effect, when his power was divided in most of his states, either by investiture or by the usurpations of the princes. Thus the vassals of the crown in Germany, Italy, and the older districts of France succeeded in depriving the king of almost all power, even of the external honours of royalty; and never, in the two first countries, and in France only after the extinction of the great baronial families, could he succeed in establishing a new authority independent of the feudal power. See MIDDLE AGES.

FEUERBACH, LUDWIG ANDREAS, German metaphysician (son of the following), was born at Landsbut in Bavaria, 28th July, 1804. After studying theology and philosophy at Heidelberg and Berlin he became a tutor at Berlin University in 1828. As his theological views were obnoxious to government, and debarred him from a professorship, he withdrew into private life, occupying himself with literary work. Afterwards he became connected with a small manufactory, but its failure left him again dependent on his pen. The latter part of his life was passed in straitened circumstances, but a short time before his death, which occurred on Sept. 18th, 1872, a subscription for his benefit was raised by a few friends. The fundamental doctrine of his philosophy is the identification of God with the idealized essence of man, or the deified essence of nature. His works include *Gedanken über Tod und Unsterblichkeit* (1830), an attack on the doctrine of immortality; *Geschichte der neuern Philosophie von Bacon bis Spinoza* (1833); *Pierre Bayle* (1838); *Über Philosophie und Christenthum* (1839); *Das Wesen des Christenthums* (1841; Eng. trans. by George Eliot, *The Essence of Christianity*, 1854); *Das Wesen der Religion* (1851); *Gottheit, Freiheit und Unsterblichkeit vom Standpunkte der Anthropologie* (1866); &c.

FEUERBACH, PAUL JOHANN ANSELM, RITTER VON, one of the most celebrated of German criminal jurists, was born near Jena in 1775, and was educated at the gymnasium of Frankfort-on-the-Main, and afterwards at the university of his native town. After strengthening his mind with philosophical studies he turned with zeal to prosecute that of law. Having published his first work, entitled *Anti-Hobbes*, in 1798, he began in 1799 to deliver academic lectures in Jena, and by a succession of works on crimes and punishments placed himself at the head of the new school of criminalists, the so-called rigorists, who make the judicial sentence entirely to depend on the decision of the penal code. In 1801 he became an ordinary professor at Jena, but the following year accepted a chair at Kiel. In 1804 he obtained an appointment in the University of Landshut, where he was employed to draw up the plan of a criminal code for Bavaria, and was in consequence in 1806 appointed *privy referee* in the ministerial, judiciary, and police departments at Munich, and in 1808 *privy-*

councillor. His penal code for Bavaria, after being repeatedly tested and somewhat modified, received the royal assent in 1818, and has been adopted as the groundwork of new codes in Saxe-Weimar, Würtemberg, and other territories, received as the code of Oldenburg, and translated into Swedish. In 1807 he began on the royal command to convert the code Napoleon into a civil code for Bavaria, but it has never come into operation. In 1817 he was appointed second president of the appeal court at Bamberg, and in the same year first president of the appeal court for the circle of Rezat at Anspach. As everything relating to public life attracted his attention, he also applied the principles of freedom and justice to religious and ecclesiastical matters, and maintained an incessant warfare with the hierarchical tendencies and encroachments of his time, whether exhibited by Protestants or Roman Catholics. In the last years of his life he took a particular interest in the fate of the unfortunate Caspar Hauser. He died in 1833 at Frankfurt-on-the-Main, while on his way to the baths of Schwalbach. Among his most interesting and important works are *Remarkable Criminal Trials* (two vols. Giessen, 1808-11), and *Themis, or Contributions to the art of Law-making*. An interesting biography of him has been written by his son (two vols. Leipzig, 1852).

FEUILLANTS, in ecclesiastical history, a religious order clothed in white and going barefoot, who lived under the strict observance of the rule of St. Bernard. The name was occasioned by a reform of the order of Bernardines, first made in the abbey of Feuillants, near Toulouse, established in 1577. There were also convents of nuns who followed the same reform, called *Feuillantines*. The first of them was established near Toulouse in 1590. Eleven years later the order transferred its head-quarters to Paris, and continued to flourish until suppressed, along with other religious orders, by the revolution of 1789. The monastery was taken possession of by a club celebrated in the political history of France under the name of the Feuillants, and of which Mirabeau was a member. It was a weak rival of the Jacobin club, and fell before the clamour of a mob in 1791.

FEVER (from Latin *febris*, connected with *ferveo*, I burn) may be described thus:—After a degree of chilliness and shivering, accompanied and succeeded by a feeling of languor, restlessness, weakness, nausea, and want of appetite, and more or less headache, there is preternatural heat of the body, which is indicated by a dry, burning skin; there is also excessive thirst, cold water being the drink which the patient has the most craving for. The pulse becomes much accelerated, there is increased waste of tissue, great muscular debility, and most of the functions are disturbed. This morbid state is noticeable amongst the phenomena of many diseases, and is then termed *symptomatic fever*, but the same symptoms, when observed in other circumstances, are characteristic of the *fevers* proper, which may be classified as follows:—

1. *Continued Fever*.—(1) Simple fever, or febricula. (2) Typhus fever. (3) Typhoid, enteric, or gastric fever. (4) Relapsing, or famine fever.
2. *Intermittent Fever, or Ague*.
3. *Remittent Fever*.—(1) Simple remittent fever.
- (2) Yellow fever.
4. *Eruptive Fevers*.—(1) Small-pox. (2) Cow-pox.
- (3) Chicken-pox. (4) Measles. (5) Scarlet-fever.
- (6) Erysipelas. (7) Plague. (8) Dengue fever.

Simple fever, or febricula, may last from one or two to ten days, and may arise from cold or any slight cause, disordering the several functions of the economy. It commences with a feeling of chilliness, and thus is often attributed to having caught a chill.

There are also a feeling of lassitude, pains in the back and limbs, loss of appetite, and nausea. After a few hours the pulse becomes accelerated, and the temperature of the body rises; these phenomena are accompanied by thirst, headache, a furred tongue, a constipated state of the bowels, and a deficiency in the urinary secretion. The symptoms are generally aggravated at night, and may even be accompanied by slight delirium. After a few days the symptoms abate, and the patient begins to recover, but very often the convalescence is somewhat slow.

The treatment consists in endeavouring to reduce the condition of excitement present in the organs of circulation by means of saline purgatives, rest in bed, a diet consisting chiefly of milk and nourishing soups, hot fomentations over the bowels, or, if necessary, the wet sheet as used by hydropathists. If the powers of the system begin to flag, they must be sustained either by increasing the quantity of milk and strong soups, to the exclusion of other fluids, or by the judicious administration of stimulants. A strict watch must also be kept over the different organs, such as the brain, liver, kidneys, lungs, &c., so that we may obviate, or, if they occur, treat inflammations and congestions in these organs. It is always very desirable to procure a free action of the skin, and with this end in view diaphoretic medicines given every three or four hours prove of immense service, but if recourse is had to the hydropathic pack this answers the purpose equally well.

FEVERFEW (*Pyrethrum parthenium*, or *Matricaria parthenium*), a common wild, composite biennial, frequent in waste places and near hedges. It has a tapering root, an erect, branching stem about 2 feet high, and stalked, compound leaves of a hoary green colour, and ovate cut leaflets. The flower-heads grow in a corymbose panicle. The involucre is hemispherical, and composed of numerous imbricated, short, membrane-edged scales. There is a very slight pappus in the form of a membranous cup. The plant possesses febrifugal, tonic qualities; it is very bitter, strong scented, and stimulating and antihysterical. It has long been regarded as an emmenagogue, and employed with success in suppressed menses, and as a relief to the pains succeeding parturition. It is used in infusion in the same way as chamomile.

FEZ (Latin, *Fessa*; Arabic, *Fds*), an important city, Morocco, nominally the second, but in reality the principal city in the empire; 100 miles east of the Atlantic, 85 miles south of the Mediterranean, and 245 miles north-east of the city of Morocco. It is finely situated on the slope of several hills, which surround it on every side except on the north and north-east, and whose acclivities are covered with orange groves, orchards, and gardens. It is divided by a small stream (Pearl River) into the New and Old City. Both are surrounded by walls, now in a state of utter decay. The streets are narrow, dark, and extremely dirty, especially in rainy weather. The houses are high and flat-roofed, with a projection on the first floor, which intercepts much of the light. Every trade or profession has a street or section of the town allotted to it. Provided markets are numerous, and abundantly supplied. There are, it is said, upwards of 200 mosques in the city, the principal of which is called El Caroubin, which contains 800 pillars, a number of gates, and two handsome fountains in the court. The most frequented mosque is that of Sultan Muley Edris, the founder of Fez, who is venerated as a saint, and whose remains are deposited here. This mosque is the most sacred sanctuary in all the country, affording safety and protection to the most atrocious criminal. All the other mosques, with exception of that belong-

ing to the palace of the sultan, are small and mean. The only other remarkable building to be seen is the sultan's palace, situated on an elevation in the new city. It is composed of a great number of courts, some half-finished, others going to decay. Its gates are always kept closed, and are, besides, vigilantly guarded, no persons but those particularly privileged being admitted. There are a great number of public baths, and several hospitals, one of which, for the treatment of lunatics, is richly endowed. There are nearly 200 caravanserais or inns. The manufactures consist of woollen cloaks, sashes, silk handkerchiefs, slippers, the leather of which the people have the art of tanning in high perfection; red caps of felt, extensively used throughout the north of Africa, and, from the place of manufacture, named *fezes*; coarse linen, fine carpets, common earthenware and saddlery. The climate of Fez is intensely hot in summer, and is, on the whole, unhealthy. Fez, founded in 793 by Muley Edris, was capital of an independent state, and subsequently became so famous as a seat of Arabian learning that its schools of philosophy and physical science were resorted to not only from all the Mohammedan states of Africa and Spain, but even from Christian countries. The remains of its institutions still attract round them a number of Mohammedan doctors, and the schools are frequented by a great many scholars; but the studies are confined to the Koran and its commentators, with a slight tincture of grammar and logic, metaphysics, alchemy, and astrology. Fez is considered a holy town by the Western Arabs, and was thus resorted to by them as a place of pilgrimage when the way to Mecca was obstructed. After its conquest, in 1548, by Morocco, it commenced to decline, but recovered for a time after the fall of the Kingdom of Cordova, and in consequence of the influx of Mohammedans from Spain. Pop. about 100,000, composed chiefly of Moors and Arabs, but with considerable numbers of Berbers, Jews, &c.

FEZ, KINGDOM OF, once an independent state, now the most northern section of the Empire of Morocco; bounded north by the Mediterranean; east by Algeria; south by the river Om-er-begh or Morbea, which separates it from Morocco Proper; and west by the Atlantic. It was conquered and united to Morocco in 1548. See MOROCCO.

FEZZAN (ancient, *Phazania*), a province of North Africa, usually considered as lying between lat. 24° and 31° N., and lon. 12° and 19° E., being thus about 460 miles in length, and about 300 miles in breadth, although its limits have not been accurately defined. It is bounded by Tripoli on the north, and on all other sides by the Sahara or Great Desert. In the northern parts are three ranges of mountains, or rather hills, as none of their elevations exceed 1500 to 2500 feet. One of these, called the Jebel-es-Sudah, or Black Mountains, is composed of basalt, nearly black, with a shining or polished appearance. They are perfectly barren, of irregular form, occasionally broken into detached masses, and sometimes rising into conical peaks. To the south of these ranges the country consists of extensive sandy plains, alternating with ridges of low hills, the valleys of which contain nearly all the cultivable soil in the territory. Dates are the principal produce, and form the chief food of the inhabitants; small quantities of maize and barley are also grown. Figs, pomegranates, lemons, and legumes are plentiful; as are also pot-herbs and garden vegetables. There are no rivers or brooks, and few natural springs; but water is found in abundance at various depths, generally from 10 to 20 feet. There are a few small lakes, the surfaces of which are sometimes covered with a thin crust of carbonate of soda. In summer it is

extremely hot, but in winter the cold is pretty severe. Rain seldom falls; in some districts it does not rain for years together, and but little at a time. With the exception of goats, few domestic animals are reared. In the southern parts some flocks of a peculiar kind of sheep are met with, and in the most fertile districts a few horned cattle. The wild animals include jackals, gazelles, and foxes. The birds of prey are vultures, falcons, &c.; there are also ostriches and bustards. The lower classes of the people are industrious, and some of them work skilfully in gold, silver, and iron. The only manufactures of the country are a little coarse linen and cotton cloth. But a caravan trade is carried on with Timbuctoo and Bornou; while Murzuk, the capital, is the rendezvous of caravans coming from Cairo, Bengazi, Tripoli, Ghadames, Twat, and the Soudan. The natives of Fezzan are a mixed race, with a strong negro element, and are of middle stature, black complexion, with hair inclining to woolly, high cheek-bones, nose less depressed than in the negro, small eyes. They are cheerful, fond of dancing and music, obliging to each other, neither passionate nor revengeful, but fraudulent, cowardly, and abject. Their houses are mostly of mud. The principal towns are Murzuk, towards the southern boundary; and Sokna, towards the northern, distant from each other about 230 miles. Fezzan since 1842 has been dependent on the Sultan of Turkey. It is somewhat loosely attached to Tripoli, but has a governor of its own, whose rule is apt to be very arbitrary. The pop. has been estimated at various figures between 50,000 and 200,000, the former being the estimate of the traveller Nauchtigal, while the latter is that of Rohlfis.

FIAR, in Scots law, the owner of an estate which is burdened with a life-rent.

FIARS, FIARS PRICES, in Scots law, the prices of grain in the different counties fixed yearly in the month of February by the respective sheriffs, assisted by juries, each of which usually consists of a certain number of heritors, a few farmers, some grain-merchants, and some entirely neutral parties, especially one or two able to check the calculations. Evidence is laid before the jury of the prices of the different grains raised in the county; and the prices fixed by the opinion of the jury and sanctioned by the sheriff as judge are called the *fiars* of that year in which they were struck, and regulate the prices of all grain stipulated to be sold at the fiars prices of the respective county; and in many sales it is agreed to accept the rates fixed by the fiars. Ministers' stipends, in so far as they consist of grain and crown dues, are also paid by the fiars prices of the county for each year. The fiars prices of all grain in every county must be struck by the imperial quarter, and it is laid down by law that any sheriff-clerk, clerk of a market, or other person offending against this provision shall forfeit a sum not exceeding £5. The procedure adopted in 'striking the fiars' is regulated by acts of sederunt of 1723 and 1728.

FIAT (Latin, let it be done), in English law, a short order or warrant from a judge for making out and allowing certain processes.

FIBRES USED IN MANUFACTURE. The textile fibres may be divided into three classes—mineral, animal, and vegetable. Of the first class the sole representative is found in amianthus, a variety of asbestos; of the second the silk obtained from the cocoons of the silkworm, and the wool of the sheep, are the more notable examples. But the wool or hair of other quadrupeds is also used to some extent, as of the goat, from the Angora species of which are obtained the materials of which mohair, Cashmere shawls, and in France a brilliant kind of lace

are made; of lesser importance are the hairs of the llama or alpaca, the camel, the bison, the musk ox, the yak, and the chinchilla. The third class furnishes by far the most numerous and varied specimens. Cotton is obtained from the fibres of the fruit of species of *Gossypium*; flax from the fibres of the inner bark of *Linum usitatissimum*; jute in the same manner from *Corchorus olitorius*, *C. capsularis*, &c.; hemp from *Cannabis sativa*; from the leaves of *Phormium tenax* is obtained New Zealand flax; Pita flax from *Agave Americana*; Manila hemp from *Musa textilis*; coir from the husk of cocoa-nut; ramie or China grass from *Boehmeria nivea*; mats, chair-bottoms, &c., from various species of Cyperaceae. For fuller details see the articles COIR, COTTON, FLAX, HEMP, JUTE, SILK, WOOL, &c.

FIBRIN. This constitutes the solid matter or clot, coloured by the red corpuscles, which deposits when blood coagulates, but it is also furnished by the chyle, lymph, saliva, and by pus, and other pathological fluids. It is best obtained by switching newly-drawn blood with a glass rod or bundle of twigs, when the fibrin adheres to the rod or twigs in threads, and is purified from colouring matter by prolonged washing and kneading with water, and then by treatment with alcohol and ether to remove fat and other substances. If the clot be taken it must be cut fine and well washed, but the trembling gelatinous mass is not so easily dealt with as the long slender elastic fibres. After it is purified it forms an opaque white or yellowish stringy mass, with a smooth greasy appearance, insoluble in water, but softening in the air and becoming dark. Its chemical constitution is quite unknown, and only its percentage composition has been determined. It is as follows:—Carbon, 52·6; hydrogen, 7; nitrogen, 17·4; oxygen, 21·8; sulphur, 1·2; but when burned it leaves an appreciable ash containing phosphoric acid. It belongs, therefore, to the albumens, and corresponds pretty closely to casein and egg albumin. It is insoluble in alcohol and ether, but is taken up more or less readily by alkalis and by acids. Thus, when treated with a dilute alkali it dissolves, forming an alkaline albuminate, and the solution is not precipitated on heating. Fibrin is soluble also in a solution of nitre and of common salt, so that the brine of salted meat contains this ingredient of the flesh. These solutions, when heated, are reprecipitated, and re-solution does not occur. If the fibrin be previously heated to about 140° Fahr. it is no longer soluble in salt, but seems to undergo a kind of coagulation. Fibrin is distinguished from other albuminous bodies by its power of decomposing hydric peroxide into water and oxygen by mere contact. In this reaction, discovered by Thénard, the fibrin remains apparently unchanged, but the explanation of it advanced by Schönbein is not quite conclusive. When acted on with nitric acid fibrin becomes yellow, like other albumins. The cause of the coagulation of fibrin has been long a topic of discussion. One of the general conclusions is, that fibrin is not contained in the fluids ready formed, but that there are two substances called respectively the *fibrinoplastic* and *fibrinogenic*, which give a coagulum of fibrin when brought in contact. It is quite certain that these two bodies can be obtained separate from each other. If a current of carbonic acid gas be passed through blood plasma (or blood deprived of its globules) a white floccy precipitate is produced. This is fibrinoplastic substance, so called because when added to certain non-spontaneously coagulable organic liquids, it makes them coagulate almost at once. It does not do this with all protein liquids, but it does produce this effect with blood plasma. The substance with which it reacts is fibrinogen, a glutinous body precipitated from the

organic fluids already spoken of. When these two bodies are mixed with due care, a clear solution is at first obtained, which afterwards coagulates spontaneously, just as blood would do, and, as a further confirmation, it has been observed that if blood be deprived of one or other of these constituents no coagulation ensues. The formation of fibrin, or, in other words, the coagulation of the blood, takes place more readily at a high than at a low temperature; and the temperature of the blood is said to be particularly favourable, so that the plastic constituents of the blood are possibly undergoing constant conversion into fibrin.

FIBROFERRITE, described by Field, is a pale, golden green mineral, consisting of hydrated basic sulphate of iron. It is soluble somewhat in water, but is decomposed on heating. It is met with in Chilli in fibrous masses, which gradually scale off.

FIBROIN, a substance obtained from silk by removing from it albumen, fatty, resinous, and colouring matters, &c. It is silky, swells up on heating, and burns with a nitrogenous odour. It is insoluble in acetic acid, water, alcohol, ether, &c., but dissolves in an ammoniacal copper solution. The same substance was formerly said to be extracted from sponge, and from some other animal products, but from their deportment with certain reagents they appear to be different.

FICHTE, JOHANN GOTTLIEB, was born of poor parents at Rammenau, near Bischofswerda, in Upper Lusatia, in 1762, and owed his early instruction to the assistance of Baron Von Milititz. At a later period he received a classical education at the famous *Schulpforte*, one of the Saxon Royal Schools. He then studied at Jena, Leipzig, and Wittenberg, passed several years as a private tutor in Switzerland and in Prussia Proper, and in Königsberg enjoyed the society of the great Kant. His *Versuch einer Kritik aller Offenbarung* (Essay towards a Criticism of all Revelation, Königsberg, 1792) attracted general attention, and procured him the professorship of philosophy in Jena in 1793. In 1800 he was one of the most prominent professors of that university during its most brilliant period. Here he published, under the name of *Wissenschaftslehre* (Theory of Science), a philosophical system, which he founded at first on the system of Kant, from which, however, he gradually deviated. On account of an article, *Ueber den Grund unseres Glaubens an eine Göttliche Weltregierung* (On the Reasons of our Belief in a Divine Government of the Universe), which appeared in his periodical *Philosophisches Journal* (vol. viii. No. 1), he fell under the suspicion of atheistical views. This gave rise to an inquiry, and Fichte, exasperated at the proceedings, resigned his professorship. After publishing an appeal against the accusation of atheism he went to Prussia, where he lived for some time in private at Berlin. In 1805 he was appointed professor of philosophy at Erlangen, with permission to spend the winter at Berlin. During the war between Prussia and France he went to Königsberg, where he delivered lectures for a short time, returned to Berlin after the Peace of Tilsit, and in 1810, on the establishment of the university in that city, was appointed professor of philosophy. Fichte's philosophy, though there are two distinct periods to be distinguished in it, is a consistent idealism, representing all that the individual perceives without himself, or, rather, all that is distinguished from the individual, the ego, as a creation of this *I or ego*. It would be impossible to give our readers, in so short a space as this work will allow, an intelligible view of his bold system. We must refer the student to his *Ueber den Begriff der Wissenschaftslehre* (Jena, 1794); *Die Wissenschaftslehre in ihrem allgemeinen*

Unruhe (Berlin, 1810); and the *Anweisung zum seligen Leben* (Berlin, 1806). His practical is purer than his theoretical system. His idealism led him to represent the life of the mind as the only real life, and everything else as a mere delusion, and to believe in an almost absolute omnipotence of the will. To excite his pupils to the highest virtue and self-denial was his constant aim as a teacher, and his influence was great, not merely through his power of expression and the originality of his ideas, but through the conviction with which he inspired his hearers of his full belief in, and entire devotion to, his principles. His heart was open to every noble and good feeling. Unshaken integrity, constant friendship, devoted love of what he conceived to be true and good, were his characteristic traits. His own excellence of life sometimes made him not very indulgent towards others; and some of his doctrines, which every one would acknowledge to be good in the main, he carried too far. When Germany was bleeding under the wounds of war he, like his countrymen in general, considered Napoleon as the source of the whole distress of his country, and in his *Reden an die deutsche Nation* (Addresses to the German Nation), published in Berlin while it was still in the hands of the French, he boldly called upon his countrymen to rise and throw off the foreign yoke. Fichte's wife was a Swiss. At the time of the battles near Berlin, in 1813, when the city was full of Prussian and French wounded soldiers, females of all classes served in the hospitals, the male inhabitants being all engaged in the war. Fichte's wife, who was among the ladies thus employed, was attacked by the hospital fever, then raging in the city. She recovered, but her husband, who had paid unwearied attention to her, was in his turn attacked by the disease, and died in consequence in January, 1814. He left a son, Immanuel Hermann, who, in 1830-31, gave to the world a Biography of J. G. Fichte, with his *Literary Correspondence*. The popular works of the philosopher, known in England through the translations of W. Smith, consist of—*The Vocation of the Scholar*, *The Nature of the Scholar*, *The Destination of Man*, *The Characteristics of the Present Age*, and *The Way towards the Blessed Life*.

FICINO, MARCELLO, a celebrated philosopher of the Platonic school, born at Florence in 1433. His father was the physician of Cosmo de' Medici, who held him in high estimation. His early display of talent attracted the notice of Cosmo, who caused him to be instructed in the ancient languages, and afterwards induced him to translate the writings of Plato and of the New Platonists into Latin; he afterwards employed him to aid in establishing a Platonic Academy (about 1460). Ficino engaged in this plan the more readily, because he viewed the Platonic philosophy as a sort of preliminary to, and confirmation of, the Christian faith. In his accounts of this philosophy he did not always make an accurate distinction between Plato and the New Platonists, as appears from his *Theologia Platonica*; *de Immortalitate Animorum ac eterna Felicitate* (Platonic Theology; on the Immortality of the Soul and Eternal Happiness), in which he particularly defends the immortality of the soul against the Aristotelians of his age. Mystic and fanciful views are interwoven with this defence; astrological doctrines, for example, which he afterwards rejected. At the age of forty he determined on entering the church, and was presented by Lorenzo de' Medici with the rectorship of two Florentine churches, and a canonry in the cathedral. He died 1499, after having formed many excellent scholars by his writings and discourses. His Latin works were first published complete at Basel, 1561, two vols. folio.

FICTION. See NOVEL and ROMANCE.

FICTION, in law, is an assumption made for the purposes of justice, though the same fact could not be proved, and may be literally untrue. There are many fictions in the civil law, and a fiction in law is said by the civilians to be the assumption of an untruth for a truth, in a thing possible to have been done, but which was not done. The declaring that a note or bond made in a foreign country was made in the county where a suit is commenced upon it, is an instance of a very common fiction, adopted on the ground that suits can be brought in the county only on causes of action existing within its limits; and so the practice has been introduced of declaring that the contract on which an action is brought was made in the county, though the fact seems to be entirely immaterial; for transitory actions follow the person, and it is only of such that the fiction is admitted. The fictitious characters of John Doe and Richard Roe long contributed to render the action of ejectment famous. But other fictions are more material. To this day in England, in an action at the instance of a father for the seduction of his daughter, damages are only awarded on the assumption that she is his servant, and that he has suffered pecuniary loss by deprivation of her services. It is a rule that a fiction of law shall work no wrong; and the fictions in use generally come within this rule.

FIDDLE. See VIOLIN.

FIDEICOMMISSUM, in the civil law, a direction of a testator that his heir shall give a particular thing (*singulare fideicommissum*), or a part or all of the inheritance (*universale fideicommissum*), immediately, or after a certain time, or on the occurrence of certain circumstances, to another. The heir, who was thus obliged to cede the inheritance to another, was called *fiduciarius*, the receiver *fideicommissarius*. Under Vespasian it was decreed that the *fiduciarius* should be allowed to retain a quarter of the inheritance at the time when he gave the rest to the *fideicommissarius*. The modern *fideicommissa* are very different. They are establishments by which an amount of property is made unalienable, and the order of inheritance prescribed. In most countries of Europe such *fideicommissa* cannot be established except with the permission of government; and in these countries the governments can also declare a *fideicommissum* dissolved, so that the estate shall follow the common rules of inheritance. From such family *fideicommissa* (*fideicommissa successiva*) the quarter of the inheritance, of course, is not deducted.

FIELD, MAGNETIC, or FIELD OF MAGNETIC FORCE, a term introduced by Faraday to designate any space possessing magnetic properties. A space may possess magnetic properties either on account of magnets in its vicinity, or on account of currents of electricity passing through or round it. The conception of the magnetic field is of great importance in the mathematical theory of magnetism. In order to express the condition of the field of magnetic force, it is necessary to specify the direction and intensity of the force at every point in it. Faraday had shown how to examine the magnetic field experimentally, and Professor J. Clerk Maxwell, in a paper on Faraday's Lines of Force (Cambridge Philosophical Transactions, 1857), and subsequently in his work on Electricity and Magnetism, has shown how the properties of the magnetic field may be expressed mathematically. Faraday employed the conception of *lines of magnetic force*, which he pictured to the imagination as traversing the field of force. A line of magnetic force is a line drawn from any origin or starting-point, so that at every point of its length its tangent is the direction of the attraction at that point. If a very short magnet is delicately suspended in

such a way as to be able to turn in any direction about its centre of inertia, and if it were carried from point to point in the magnetic field it would indicate at each point the direction of the magnetic attraction. If such a needle were carried from any origin or starting-point, *always in the direction in which it points*, it would trace out a line of magnetic force passing through that origin. By drawing these lines of force according to rule, Maxwell indicates the intensity of the force at every point as well as its direction. Thus 'if in any part of their course the number of lines passing through unit of area is proportional to the intensity, then the same proportion between the number of lines in unit of area and the intensity will hold good in every part of the course of the lines. All that we have to do, therefore, is to space out the lines in any part of their course, so that the number of lines which start from unit of area is equal to the number representing the intensity of the field there. The intensity at any other part of the field will then be measured by the number of lines which pass through the unit of area there: each line indicates a constant and equal force.' A 'uniform field of force' is a field in which the lines are straight, parallel, and equidistant. Any space on the earth's surface unaffected by the presence in it of magnets or magnetic matter, is a uniform field of force. Faraday has shown in his *Experimental Researches* how to obtain from artificial magnets, with properly shaped poles, a uniform field of force.

FIELD-ALLOWANCE, an extra payment made to officers of the British army on active service in the field, to compensate partly the enhanced price of all necessities. Ordinary field allowance, ranging from 30s. per day for a general officer, to 1s. for a subaltern, is granted when troops are encamped at home or in the colonies; extraordinary field-allowance, whenever troops are engaged in actual warfare, ranges for the above ranks from 50s. to 1s. 6d. No officer is entitled to this allowance unless positively present with the army.

FIELDFARE (*Turdus pilaris*), a species of thrush. The length is between 10 and 11 inches, alar extent 17½ inches, and the weight about 4 oz. It is a stout bird, and from its long tail and wings rather elegant in form. In colour it bears a great resemblance to the generality of thrushes; the upper parts of the body as far as the shoulders are ashen gray, dotted with dark-brown spots on the head; the back and wings are rich brown, and the tail blackish brown; the chin and throat have a peculiar hue not unlike amber, and are covered with numerous black streaks; the breast is reddish brown, also spotted with black, and the abdomen and under parts white spotted on the flanks with various shades of brown. The bird is a winter visitant of Britain, seldom seen until November or December, and then making its appearance in great flocks. It departs about May or June. They have sometimes been observed to build in this country, but the northern parts of Europe, such as Norway and Sweden, is where they chiefly breed. They frequently build in society, and as many as two hundred nests may be found within a short distance of each other. Their food consists of hawthorn and other berries, worms, larvae, insects, seeds, and grains. The bird's first shyness on its arrival in Britain soon wears off, and it becomes a tempting object to the young sportsman. See illustration at ORNITHOLOGY.

FIELDING, COOPLY VANDYKE, a distinguished painter in water-colours, was born about 1787, and early attracted attention by his water-colour landscapes. He gained also considerable reputation as a teacher, and for many years before his death was president of the Society of Painters in Water-colours.

His pictures are chiefly taken from English scenery, the various features of which, both in rich woodland and open plain, he has represented with great delicacy and truth. Oil-painting was also attempted by him, but with no great success. He died at Worthing, Sussex, in 1855.

FIELDING, HENRY, was born at Sharpsham Park, in Somersetshire, the seat of his father, General Edmund Fielding (a member of the Denbigh family), April 22, 1707. He was educated at Eton, whence he removed to Leyden; but the straitened circumstances of his father shortened his academical studies, and the same cause, added to a dissipated disposition, turned his attention to the stage. His first dramatic piece was entitled *Love in several Masks*, which met with a favourable reception, as did likewise a second, called the *Temple Beau*. He did not, however, generally succeed as a dramatist; for although no man possessed a stronger feeling of the ridiculous, or executed detached scenes with greater humour, he took too little time to construct his dramas, with a view to plot and effective development. Many of his are little more than free translations from the French, as, for example, the *Miser*, the *Mock Doctor*, &c. Some of his burlesques or farces were exceedingly amusing, in particular his *Tom Thumb*. In some of his pieces he touched upon politics, and was one of the writers who gave Sir Robert Walpole a pretext for his act to limit the number of theatres, and submit dramatic performances to the licence of the lord-chamberlain. This led to Fielding's giving up a theatre which he had opened shortly before (1736). By this time he had a family to support, having married a Miss Craddock, a lady of some fortune, and having set up as country gentleman on a scale which, in three years, reduced him to poverty. He now dedicated himself to the bar as a profession, was called in 1740, but had no great success. He still continued to employ his pen on various miscellaneous subjects, but no longer wrote plays. In 1742 appeared his first novel, *Joseph Andrews*, in which the Cervantic style of humour is admirably imitated, and in which also the overstrained sentimentality of Richardson is unsparingly ridiculed. The success of this book was largely owing to the inimitable figure of Parson Adams. His next publication (1743) was entitled *Miscellanies*, and included *A Journey from this World to the Next*, and the *History of Jonathan Wild*. Soon after the appearance of *Joseph Andrews* he suffered from repeated attacks of the gout, and he then experienced a much more serious affliction in the death of his wife. In 1745 he published a weekly paper entitled *The True Patriot*, which was followed by the *Jacobite Journal*. These labours on the side of the government were rewarded with the then not altogether reputable—and not particularly remunerative—office of a Middlesex justice. To the credit of Fielding, however, he did much to render it more respectable by giving attention to the prevention of crimes and to the regulation of the police. He published more than one tract upon the subject; and the principal of them, his *Inquiry into the Cause of the late Increase of Robbers*, &c. (1750), made a great impression at the period. It was in the intervals of more serious occupations that he wrote his celebrated *Tom Jones*, published in 1749, which was followed in 1751 by *Amelia*. At length, however, his constitution began to yield to the repeated attacks upon it, and he was recommended by the faculty to take a voyage to Lisbon. He followed their advice; and the last gleams of his wit and humour are to be found in his journal on that occasion. He reached Lisbon in August, 1754, and about two months after expired. The chief merits of Fielding as a novelist are wit, humour, correct delineation of character, and know-

ledge of the human heart. No novel exceeds Tom Jones in the exhibition of character and manners, in the development of the story, and the management of the catastrophe. Amelia, with less variety and invention, is, in regard to portraiture and knowledge of life, almost equally felicitous; while, as to pure raciness of humour, Joseph Andrews is often deemed before both. Even Jonathan Wild, coarse as are the persons and doings described, is irresistible in the way of humorous irony, as well as instructive as a satire. See Austin Dobson's *Henry Fielding* (1883).

FIELDING, SARAH, third sister of Henry Fielding. She was born in 1714, lived unmarried, and died at Bath, where she long resided, in April, 1768. She was the author of the novel of *David Simple*; a less popular production of a kindred class, called *The Cry*, a dramatic Fable; *Xenophon's Memoirs of Socrates*, translated from the Greek (for which she was favoured with some valuable notes by Mr. Harris of Salisbury); *The Countess of Delwyn*; *The History of Ophelia*; *The Lives of Cleopatra and Octavia*; and one or two more of a minor class.

FIELD-MARSHAL, the highest military dignity in Britain, Germany, and other countries. George II. introduced the title into England when, in 1736, he created the Duke of Argyll and the Earl of Orkney field-marshal, but it had been long in use in the German armies, and is of German origin. In Britain the dignity is conferred by selection and enjoyed by but a very few officers, and chiefly for distinguished services or on the ground of royal descent. When not on active service, the field-marshal's pay is no higher than any other general, but when commanding an army he receives £16, 8s. 9d. a day, while a general has but £9, 9s. 6d.

FIELD-MOUSE. See **MOUSE**.

FIELD-OFFICERS, in the army, those competent to command whole battalions—majors, lieutenant-colonels, colonels, as distinguished from those intrusted with company duties, as captains and lieutenants.

FIELD OF THE CLOTH OF GOLD, a spot in the valley of Andren, between the English castle of Guimenes and the French castle of Ardres, celebrated for the meeting between Henry VIII. of England, and Francis I. of France, attended by the flower of nobility of both nations. The meeting took place on 7th June, 1520, and had been planned by Cardinal Wolsey, to enable the two kings to come to an understanding as to an alliance against Charles V. of Spain, whose recent election as German Emperor threatened to destroy the balance of power in Europe. The diplomatic results of the meeting amounted to but very little, as Wolsey had been bribed a short time previously by Charles, and the event is now memorable as a grand historic pageant in which the kings and nobles of France and England for three weeks endeavoured to outshine each other in gorgeous apparel, and all the pomp and circumstance of mimic war.

FIELD-PIECES, small cannons, from three to twelve pounders, carried with an army.

FIELD-WORKS, in fortification, are those thrown up by an army in besieging a fortress, or by the besieged to defend the place; as the fortifications of camps, highways, &c.

FIERI FACIAS, in law, is a judicial writ of execution issued on a judgment, by which the sheriff is ordered to levy the amount of the judgment on the goods and chattels of one party, for the benefit of another. See **EXECUTION**.

FIEBY CROSS. See **CRANTARA**.

FIESOLE, GIOVANNI LUIGI DE', Count of Lavagna, a distinguished victim of unsuccessful ambition in the sixteenth century, was the head of one of the

noblest houses in Genoa. He became master of a large patrimony at the age of eighteen, and being surrounded with dependents and flatterers, and really possessing considerable talents and eloquence, he was readily induced to aim at that power and distinction in the state which was then possessed by the family of Doria, headed by the famous Andrea Doria. The latter, whose patriotism and great qualities had justly raised him to the distinction of first citizen, being too intent upon the elevation of his nephew Giannettino, a youth of brutal and insolent character, a great degree of discontent was engendered among the nobles of Genoa, who, forming a party against Doria, willingly accepted a leader of the wealth and talents of De' Fieschi. The court of France, anxious to detach Genoa from the interest of the emperor, was easily induced to favour this enterprise, to which the concurrence of Pope Paul III. was also offered. Although Andrea Doria received some intimation of the design in agitation, De' Fieschi conducted himself with so much circumspection and apparent tranquillity that he could not be induced to believe aught to his prejudice. After several meetings the plan of the conspiracy was fixed, and the destruction of the Doria family formed an essential part of it. On the evening of January 1, 1547, De' Fieschi, who had prepared a galley under pretence of a cruise against the corsairs, waited upon Andrea Doria to request permission to depart from the harbour early in the morning, and took his leave with strong demonstrations of respect and affection. The same evening, however, he assembled a large body of his partisans at his house, on the pretence of an entertainment, to whom he made a warm and eloquent address; and, their concurrence being unanimous, he hastened to the apartment of his wife and acquainted her with his intention. She earnestly and in vain entreated him to abandon his desperate undertaking. While the city was buried in sleep he sallied forth, preceded by 500 armed men, and, despatching parties to different quarters, himself proceeded to secure the dock in which the galleys lay. He went on board one of these, from which he was proceeding across a plank to the captain galley, when the board gave way, and falling into the water, encumbered with his armour, he sank to rise no more. His confederates failed in their attempt on Andrea Doria, but Giannettino fell beneath their swords. The loss of their leader, however, proved fatal to the conspiracy; his brother Jerome was deserted, and the whole family paid the penalty of the ambition of their head by ruin and proscription.

FIESOLE (anciently *Farula*), a small town in the province, and 4 miles north-east of Florence, Italy, on the top of a steep hill, the front of which is cut into narrow terraces faced with stone; and its recesses, swells, and breaks covered with groves of pines, holly, and cypress, above which rises the dome of the cathedral. The town itself has little to boast of, being indebted for all its celebrity to its antiquity and happy situation. Under the name of *Fesule* it was one of the twelve Etruscan cities. It submitted, with the rest of Etruria, to the Roman power, and was colonized by Sylla. In the commencement of the eleventh century it was destroyed by the Florentines, and a number of its inhabitants transported to Florence. Pop. 5000.

FIESOLE (so called from the monastery to which he belonged), one of the most celebrated restorers of painting in Italy. His family name was Santi Tosini. He was born, 1387, at Mugello, a district of the Florentine territory. In 1407 he entered the Dominican order, under the name of *Fra Giovanni da Fiesole*. He was also called *Angelico* and *Il Beato* (the Blessed), on account of his pious life and his

sacred pictures, in which grace and angelic beauty are the leading characteristics. He not only ornamented sacred books, but also executed large fresco paintings for his monastery. His industry was immense, and all the profits were expended in acts of benevolence. His merits were soon known and acknowledged. Cosmo de' Medici, who personally knew and loved the pious artist, employed him in painting the monastery of St. Mark and the church of St. Annunziata. In the monastery of St. Mark he adorned all the cells with large fresco paintings; and a fine Annunciation, among other paintings, is still discernible upon the walls. These pictures gained him so much celebrity, that Nicholas V. invited him to Rome, to ornament his private chapel in the Vatican, the chapel of St. Laurence, with the most important scenes from the life of this saint. Vasari relates the most striking anecdotes of the piety, humility, innocence, and purity of this master, which also show that he considered the exercise of his art as a most solemn and sacred employment. So scrupulous was he in the observance of the rules of his monastery, that the pope, perceiving how much his pious fasts and unceasing labour affected his health, gave him permission to eat animal food. He replied, with great simplicity, 'My prior has not granted me permission to do it.' Such was his submission, that he would undertake no work for other monasteries, or for private persons, without the consent of his superiors, to whom he always delivered the proceeds. He declined, with humility, the dignity of Archbishop of Florence, offered him by the pope, and which was bestowed at his request on Brother Antonino, who, he said, was more worthy of it. He died in 1455 at Rome, where he had painted the chapel of the Holy Sacrament in the Vatican, and was buried in the church Della Minerva. He has been beatified by the church. His only undisputed scholar whose works still remain, was Benozzo Gozzoli, whose numerous and well-preserved paintings are found in the Campo Santo in Pisa.

FIFE, a small instrument of the flute kind much used in military bands, pierced with six finger holes, and usually having one key. Its ordinary compass is two octaves from D on the fourth line of the treble staff upwards. It is characterized by a clear and piercing tone.

FIFE, or **FIFESHIRE**, a maritime county, Scotland, forming the peninsula between the Firths of Forth and Tay. Extreme length, south-west to north-east, 43 miles; extreme breadth, 17 miles, decreasing west to about 12 and 6 miles. Bounded s. by the Forth, n. by the Tay and the counties of Perth and Kinross; e. by the German Ocean; and w. by the county of Clackmannan and an isolated portion of Perth. The surface of the country is finely diversified by mountain, valley, and plain. The principal elevations are the Lomond Hills, whose highest summit is 1720 feet above sea-level; Largo Law, 1020 feet; and Norman Law, 850 feet. There are, besides these, a number of lesser, though still considerable, eminences in various other parts of the county. The soil is in general productive. Out of the total extent of 324,489 acres, about 74,000 are under cereal crops. The principal valley, called the 'Howe (hollow) of Fife', watered by the Eden, is very fertile, highly cultivated, and thickly studded with beautiful mansions and villas. Its entire length is about 10 miles; breadth, from 2 to 3 miles. But, perhaps, the most fertile tract is that lying along the shores of the Firth of Forth, extending inland from 1 to 3 miles, where the most luxuriant crops of corn, turnips, &c., are grown. The least productive, again, lies between the town of St. Andrews and the north-western parts of the county. The soil throughout

this tract consists of a wet clay, and is, in general, cold and poor. There is also a good deal of barren land, composed of moss, moor, and rocky hill, in the western districts of the county, and along the shores of the Firth of Tay. In the higher grounds, and on inferior soils, oats are the principal crop; but, in general, all the most approved rotations are regularly followed out, and with barley, beans, potatoes, and turnips are extensively cultivated. Cattle and sheep are reared in considerable numbers. Coal, iron, limestone, and freestone abound. The coal has been worked for several centuries, but the ironstone, especially that species of it known by the name of black-band, is a comparatively recent discovery. It supplies a number of blast-furnaces. The chief manufactures of the county are linens of different kinds, such as damasks, diapers, checks, &c., and floor-cloth. The linens are made principally at Dunfermline, the floor-cloth at Kirkcaldy. There are salmon fisheries on the Leven and Eden, and at Newburgh, and extensive herring fisheries along the north-east, east, and south coasts. Cod, turbot, haddock, and other sea-fish are also taken in great quantities on the coasts. The number of towns and villages in this county is remarkable, the entire south and east coast being lined with them. The principal of the former are Dunfermline, Kirkcaldy, St. Andrews, Cupar, the county town, and Dysart. Fife contains sixty-three parishes, thirteen royal burghs, and a university, St. Andrews, the oldest in Scotland. It returns two members to the House of Commons, one for East and one for West Fife. Pop. (1891), 187,576; (1901), 218,848.

FIFTH, an interval in music, and the most perfect of concords, the octave alone excepted. Its ratio is 3 : 2. It is called the fifth as it comes, by diatonic ascent, in the fifth place from the fundamental or tonic. See **MUSIC**.

FIFTH-MONARCHY MEN, a set of politico-religious enthusiasts who sprang up during the Protectorate of Cromwell. They accepted a current opinion of the time that the four great kingdoms of Antichrist mentioned by Daniel, the Assyrian, the Persian, the Grecian, and the Roman, were to be followed by the descent of King Jesus to reign for ever on the earth. They further believed that this advent was close at hand, supplementing it with the dangerous doctrine that physical force should be employed to pave the way for his reign. When the sect, who were of the extreme republican type, fancied Cromwell was aiming at the royal title as well as power, they raised a conspiracy against him (1657), which was quickly discovered. Their leaders were thrown into prison, and were only liberated on the death of the Protector. The sect became extinct shortly after the Restoration.

FIGEAC, a town, France, department Lot, beautifully situated on the right bank of the Célé, in the centre of an amphitheatre of wooded hills, vine slopes, orchards, and gardens, 32 miles N.W. of Cahors. It is an ancient place, owing its origin to a monastery erected by Pepin I. of Aquitaine, about 820, and consists chiefly of narrow crooked streets and antiquated houses with quaint Gothic fronts. The most remarkable objects are some remains of its fortifications, a town-house, which was once a feudal keep, and a church, which originally belonged to its abbey. The manufactures consist of linen and cotton goods, and there are several tanneries and dye-works. Champollion, the Egyptologist, was born here. Pop. (1896), 4727.

FIG-TREE (*Ficus cariosa*) is a native of Asia, Africa, and the south of Europe, and has been cultivated from remote antiquity in the countries surrounding the Mediterranean, where figs form a principal article of food in many places. It belongs to

the natural order *Artocarpaceae*, sub-order *Moresae*. The male and female flowers are mixed indiscriminately on the inside of a fleshy receptacle, which is concave in form, with its edges drawn together into a narrow opening. What are called the seeds in the ripe fig are the pericarps, each containing a single seed. The fig-tree is distinguished from almost all others by the extraordinary property of producing two crops of fruit in the same year on distinct shoots, in climates congenial to its growth. The shoots formed by the first or spring sap put forth figs at every eye as soon as the sap begins to flow again in July and August. These figs which form the second crop of the year ripen in their native climate during the course of the autumn, but rarely if ever come to perfection in England. The shoots formed by the second flow of sap, commonly called midsummer shoots, put forth figs in like manner at every eye, but not until the first flow of sap in the following spring. These last-mentioned figs, which form the first crop of each year, ripen in warmer climates during the month of June and July, but not in this country before September or October. The fig-tree, in its wild state, is a low, distorted shrub, bearing fruit destitute of any agreeable flavour. Dried figs are easier of digestion and more nourishing than the fresh fruit, and form a considerable article of commerce. The best come from Turkey, Italy, Spain, and Provence; those of the Archipelago are inferior in quality. Dried figs, with barley bread, are now the ordinary food of the lower classes in Greece and the Archipelago. The ancients procured a sort of wine from figs by a method which is still in use in the Archipelago. Several hundred varieties are cultivated in Europe, some of which are excellent. There are five principal methods of reproducing this valuable tree:—1. By seeds, which is but little employed on account of the length of time requisite for bearing, and the fruit is not always of as good quality; but it is the only method by which new varieties can be produced. The figs should be first washed in water, and those seeds rejected which float upon the surface. 2. The easiest mode is by suckers, which may be separated from the roots of the old trees. 3. In the month of March or April branches are passed through pots containing earth, which is occasionally watered to keep it moist; roots are produced with facility, and the branches may be separated in the autumn. 4. A method which requires less trouble and is most in use is the following:—In March or April a bough about 2 feet long and two years old is selected; the largest of its branches is reserved for the future stem, and the others are extended in the earth and give out roots; care should be taken to cover at least two-thirds of the bough with earth, otherwise the terminal shoot is not developed. 5. Grafting has been neglected on account of the facility with which the fig may be reproduced by these two last methods. Almost every variety bears fruit twice in the season. For the process of *cappification*, as it is called, which is sometimes resorted to in order to increase the yield of the figs, see the article *CAPPIFICATION*.

The species of the genus *Ficus* are shrubs or trees, with alternate leaves and branches, and having a milky and more or less acid juice, inhabiting the intertropical regions of the globe, a few species excepted, which are found in warm climates, though without the tropics. More than 100 species are known, the most remarkable of which are the following:—*F. sycomorus*, a large tree the fruit of which is eaten in Egypt and the Levant. The wood is said to be incorruptible, which would seem to be proved, as the cases containing the Egyptian mummies are made of this tree. *F. indica* (*Urostigma*

indicum) is the Indian fig or banyan tree, celebrated from antiquity from its letting its branches drop and take root in the earth, which, in their turn, become trunks, and give out other branches, a single tree thus forming a little forest. *F. elastica* (now called *Urostigma elasticum*), the juice of which, as well as that of some other species, yields *caoutchouc*, is a native of the mountains of Nepal.

FIGUERAS, a town, Spain, Catalonia, in a plain 21 miles N.N.E. of Gerona. It is defended by a fortress, and has manufactures of woollen and linen fabrics, leather, soap, corks, &c., and a trade in these and in grain, oil, and liquors. Pop. (1887), 11,912.

FIGURAL (or FIGURATE) NUMBERS, an arithmetical amusement much in vogue at the beginning of the seventeenth century. Jac. Bernouilli, and particularly Wallis, in his *Arith. Infin.*, and L'Huilier in his *Algebra*, have made it a subject of investigation. These numbers are formed by the terms of arithmetical series of all sorts, in which the first member is always unity. For example:—

I.—1,	2,	3,	4,	5,	6, &c.
II.—1,	3,	6,	10,	15,	21, &c.
III.—1,	4,	9,	16,	25,	36, &c.
IV.—1,	5,	12,	22,	35,	51, &c.

Those in the second row are called *triangular* numbers, because their units may be arranged in pure equilateral triangles; the members of the third row are called *square* numbers; those of the fourth, *pentagonal*, &c.; and so there are also *hexagonal*, *heptagonal*, and, in general, *polygonal* numbers. If the terms of the polygonal series are again added, in succession, we obtain other orders, as the members of each of the rows are called; thus:—

a.—1,	3,	6,	10,	15,	21, &c.
b.—1,	4,	10,	20,	35,	56, &c.
c.—1,	5,	14,	30,	55,	91, &c.
d.—1,	6,	18,	40,	75,	126, &c.

are pyramidal numbers, because, by placing over one another the polygonal numbers in the order in which they are added, so that the smaller come over the next larger of the same sort, regular pyramids are formed. Thus the members of the row *a* form triangular, of the row *b*, quadrangular, and of the row *c*, petagonal pyramids.

FIJI, FEEJEE, or VITI ISLANDS, an island group, South Pacific Ocean, east of the New Hebrides, between lat. 16° 30' and 19° 30' S.; and lon. 177° E. and 178° W. The entire group, which was discovered by Tasman in 1643, comprises altogether 280 islands, eighty of which are inhabited, and is subdivided into two minor groups, the Eastern and Western or Asava group. There are numerous spacious outlets or passages to and from the central space, inclosed by the group known as the Goro Sea. Two of the islands only are of large size, namely, Viti Levu and Vanua Levu. The other principal islands are Vuna, Kandavu, Ovalau, Bau or Ambow, Muthuatu, and Goro; some of the others, though smaller, are populous. Most of the remainder are mere islets. They are of volcanic origin, but no signs of volcanic heat have been met with, excepting at Savu-Savu, on the south shore of the large island of Vanua Levu. Appearances of craters, however, are frequent. The peaks are usually basaltic cones or needles, some of which rise to the height of several thousand feet. A luxuriant foliage covers these islands to their summits, giving them a singularly pleasing and picturesque aspect. The coasts are almost surrounded with coral reefs, and where the shore is not precipitous the beach is formed of fine coral sand. The soil is generally fertile, consisting of a deep yellow loam, with a large admixture of vegetable matter. The coconut palm grows along the sea-coasts; the bread-fruit, banana, and pandanus are abundant; the orange, taro, yams,

sweet potato, maize, tobacco, and the sugar-cane are cultivated; timber trees, including the chestnut, are plentiful; sandal-wood was abundant, but is said to be now exhausted. The paper-mulberry furnishes a fibre from which the natives manufacture fine cloth, which they also print. Swine, introduced by Captain Cook, are in general use as food, and fish are plentiful in the surrounding seas. The birds are wild-ducks, pigeons, the domestic fowl, parrots, and other tropical species. The inhabitants are given to agriculture, and inclose, dig, and irrigate their lands, using iron implements introduced by traders; the women perform most of the manual labour. They manufacture arrow-root and cocoa-nut oil. The houses are of various forms: some are built upon posts, and are of great size, occasionally 100 feet long and 40 feet wide, thatched with loose grass and without windows. The sexes sleep in separate houses. The houses are often neatly constructed, and surrounded with ornamental grounds very tastefully arranged. A remarkable structure is the *mbure* or spirit house, for the worship of certain deities, built on a raised and walled mound, nearly twice as high as it is broad at its base, and having a singular sharp-peaked roof. Of such structures each town has at least one, and often several. The towns are usually fortified with strong palisades, and have but two entrances, in which are gates, the passage being so narrow as to admit only one person at a time. The native dress is scanty. The women wear a fringed band or apron made of the fibre of the paper-mulberry, which is tied on the right side, and is sometimes long enough to form a train. The men wear round their loins a kind of sash, also made from the paper-mulberry, white, brown or figured. The mean temperature at Ovalau, one of the most beautiful islands of the group, about 8 miles long by 7 miles broad, during the six weeks that the observatory of the United States exploring expedition was established there, was 77°-81°. The mean of the group is about 80°. The climate as a whole is healthy and agreeable; there is a wet season from October to May. Vegetation is very rapid. In 1861 Dr. See-man took out a quantity of sea-island cotton seed, which was sown on the 9th of June; on 18th October the plants were from 4 to 7 feet high, full of ripe pods and flowers; so that he was able to bring back to England, from which he was absent only thirteen months, a crop from the very seed he had taken out. The early character of the islanders was bad. They had deservedly the reputation of being cannibals. In 1804 some convicts escaped from New South Wales to Viti Levu, and exercised no good influence upon the natives. The quarrels among the people became more frequent and sanguinary, and some of the defeated chiefs called in the aid of the natives of Tonga. The immigration of the Tongans had one good result: Christianity had been introduced among them, and a party of missionaries followed them to Fiji. Since then the missionaries have had so much success that the whole people profess Christianity. Over 800 churches have been built. The Bible has been translated into a dialect generally understood throughout the group, schools have been established and many of the arts of civilization introduced. In 1859, as a remedy against intestine disorders, and to avert aggressive demands made by the American government, King Thakombau offered to resign the sovereignty of the islands to the Queen of England. This offer, after being several times repeated and declined, was at last accepted in 1874, and the Fiji Islands were accordingly made a crown colony.

The following account of the political organization of the islands is given by Sir Arthur Gordon, the first governor of the colony. 'The political unit is

the village. In every one of these is found a local chief, practically hereditary, but nominally appointed by the district council, of which I shall hereafter speak. He is assisted by a council of elders and certain executive officers, a magistrate (frequently the chief's brother), one or more constables to carry out his decisions, a town-crier (a hereditary and important officer), and a garden-keeper. . . .

An uncertain number of villages—sometimes few, sometimes many—are grouped together under a superior officer, the Buli of the district, who once a month assembles all his town chiefs, and discusses with them in the Bose ni Sikina, or district council, the affairs of his own district. . . . In a similar manner the Buli districts are grouped under the headship of a greater chief, the Roko Tui, of whom there are twelve, and each of whom twice a year assembles the Bulis of his province, in the Bose vaka Tasana, or provincial council, where the local affairs of the province are discussed and settled, by which local rates are imposed, and to which each Buli makes a detailed report of the condition of his own district.

'This organization is purely native and of spontaneous growth. To it has now been added a meeting annually of the Roko Tui, with myself, thus completing the chain from the village to the governor. This Bose vaka Turanga, or great council, is also attended by the native espendiary magistrates, and by two Bulis from each province, chosen by the Bose vaka Tasana. At it each Roko Tui in turn makes a detailed report of the state of his province, and suggestions are offered as to executive and legislative measures, which it is thought desirable by those assembled that the government should adopt. The suggestions made by the Bose vaka Turanga have received, and I think merited, the warm commendation of Her Majesty's government on account of the good sense and practical capacity for affairs therein displayed. There is a curious, though unconscious, resemblance between them and some of the short acts of the ancient Scottish Parliaments in the first years of the fifteenth century; and it should always be borne in mind that the state of society for which they are intended is not that of England in the present day, but more nearly resembles that of the Highlands of Scotland some three or four hundred years ago, or that of the remote parts of Ireland in the days of Queen Elizabeth—except, indeed, that property and life enjoy in Fiji a security then unknown in either Scotland or Ireland; that reading and writing are far more widely known among the Fijians than among the Celtic population of the fifteenth and sixteenth centuries; and that they are far better housed than the Highland and Irish peasantry of either that or a much later day.'

Since the Fiji Islands became a British crown colony, their prosperity has been remarkable. In 1876 the value of the imports from British possessions was £94,411; in 1897 it had risen to £242,106. The exports to British possessions in those two years were valued at £86,494 and £415,836 respectively. The chief article of export is sugar, in 1897 valued at £323,830; the next is copra, the dried kernels of the cocoa-nut, value in 1897, £70,182. The other important exports are bananas, spirits, pea-nuts, &c. Up to 1876 the demand for labour was fairly met by Polynesian; but since then many coolies have been introduced. The more important towns in the group are Suva, Vanua Levu, and Levuka, the latter of which has a good harbour. The income averages about £75,000, and the expenditure about £73,000. The total area of these islands is 8045 square miles; the population was returned in 1901 at 117,870. The island of Rotumah, to the north, was annexed to the Fiji group in 1880.

FILANGIERI, GASTANO, one of the most celebrated political writers of the eighteenth century, was a son of Omasar, prince of Aranello, and was born at Naples in 1752. He was destined for the military service, but having against the wishes of his family commenced the practice of the law, his learning and eloquence soon made him distinguished, and the patronage of Tanucci, the prime minister of Naples, secured him stations of honour at the court, which did not, however, divert him from his favourite studies. He engaged in the preparation of a work which was to embrace the whole science of legislation; and as the celebrated Beccaria, at Milan, had already published his essay on crimes and punishments, which formed a new epoch in criminal legislation, Filangieri intended to examine all the relations, and explain the fundamental principles of legislation in general. He executed this task with great depth of thought and soundness of judgment. He divided the work, *La Scienza della Legislazione* (The Science of Legislation), into seven books, of which the first, containing the general principles of legislation, and the second, treating of the principles of legislation in their application to political economy, appeared (1780) at Naples in two volumes. This work met with prodigious success, not only in Italy, but all over Europe; and the author, at the age of twenty-eight, was ranked among the most distinguished publicists. He speaks with boldness and independence of abuses, and although he exposes those of his own government, the king conferred on him the commandery of the royal order of Constantine. In 1783 he published the two next volumes, on criminal jurisprudence. This subject he treated in its whole extent, and exposed abuses or defects with the same freedom and boldness. His exposure of the evils of the feudal system and of the abuses in the church excited the fears of the high nobility and clergy, and his work was condemned by an ecclesiastical decree of Dec. 6, 1784, as tending to foster sedition and atheism. His only reply to the feudallists and curialists was the publication of the fifth, sixth, and seventh volumes of his work, which treat of education, morals, and public instruction. He died July 21, 1788, aged thirty-six, having previously completed the eighth part of his work, on the religions that preceded Christianity. Of the last book, which was intended to treat of religion as connected with the state, we have only the divisions of the chapters. This work has been often translated.

FILBERT, the fruit of the European hazel. See **HAZEL**.

FILE, a well-known steel instrument with small sharp-edged elevations on its surface called teeth, the use of which is to cut into or abrade metals, wood, ivory, horn, &c. Files are of various shapes, as flat, half-round, three-sided, square, or round, and are generally thickest in the middle, while their teeth are of various degrees of fineness and of different forms. Some files have their teeth formed of parallel ridges raised by a flat chisel, and are called single cut; or there may be two series of ridges crossing each other, when the files are called double cut. Files whose teeth are formed by a triangular sharp-pointed tool are properly called *rasps*. Single-cut files are used mostly for brass and copper, and have their teeth running obliquely across; double-cut files, on the other hand, are better suited for iron and steel. Rasps are used chiefly for wood and horn. The larger and coarser files are made from blistered steel of inferior quality; the finest files, for watch and clock making, from steel made from the best Swedish iron. The pieces of steel when brought into the shape of the file, but before receiving the teeth, are called 'blanks'. The flat and square blanks are formed by the ham-

mer alone, the half-round and three-sided blanks are made by hammering them into a groove or die of corresponding shape. When the blanks are finished the file-cutter receives them for the purpose of cutting the teeth. Laying the blank on his anvil, and holding it in its place by means of leather straps through which his feet pass in the manner of stirrups, the workman strikes a blow on his chisel, which rests obliquely on the blank, and each blow raises a ridge or tooth. The strength of the blow depends on the hardness of the metal, and when one part is harder than another the workman alters his blows accordingly. The chisel is generally a little broader than the file, just long enough to be held easily between the fingers and thumb, somewhat as a pen is held, and is made of good tough steel. When one side is covered with single cuts, if the file is to be double cut he adds in the same manner a second series, crossing the others at a certain angle; and when one side is completely finished the next is begun, a flat piece of alloy of lead and tin being interposed between the anvil and finished side in order that the latter may not be injured. The round sides of files are also cut with straight-edged chisels, 'many rows of short cuts being made from the top to the bottom of the file, and these cuts uniting together at their extremities, thus form a complete series of lines passing completely round the cylinder or half-cylinder as the case may be. In fine round files as many as from ten to twenty rows of cuts are required to cover the surface with teeth; and when it is considered that there may be upwards of a hundred teeth within the space of an inch, some idea may be formed of the many thousand blows required to raise the teeth on a fine file' (Tomlinson). The files have to be hardened before they are fit for use, though those that are used for soft substances, as wood or ivory, do not require hardening. They are hardened by heating them to a cherry-red colour and then dipping them in water. Before they are inserted in the fire they are drawn through ale grounds or other adhesive fluids and then through pulverized salt, by which means they receive a coating that protects them from the direct action of the fire and the oxidizing influence of the air. The fusion of the salt also shows when the proper hardening heat is attained. The process of cutting causes the files to become slightly curved, a defect which has to be remedied before the hardening is completed. This is done by gradually heating them to a dull red and striking them with a leaden hammer on a leaden anvil. After the straightening and hardening the files are scoured with brushes dipped in sand and water, or powdered coke and water, every particle of salt is removed from them by letting them stand for some hours in lime-water, they are then thoroughly dried at the fire, and being rubbed over with olive-oil containing a little turpentine, are considered finished. Various file-cutting machines, more or less ingenious, have from time to time been invented, but they have not been perfectly successful, and cannot be said to have superseded hand labour to any extent.

FILE, a row of soldiers ranged one behind another from front to rear. When a column is arranged two deep, a file is thus two men.

FILIBUSTERS, a name given to those adventurers, chiefly from the United States, who endeavour to effect settlements on the Spanish islands and colonies in Central America. The term is of Spanish origin, being from *filibote* or *filibote*, a species of small fast-sailing vessel used by the buccanniers in the seventeenth century, but this is the English *fly-boat* in disguise. After the termination of the last war between the United States and Mexico, piratical expeditions to the Spanish American terri-

aries became very frequent, and though prohibited by law, were nevertheless often supported by men of capital and influence, and hence winked at by the government authorities. Attempts were made to justify these proceedings on the plea of introducing the free and democratic institutions of the United States into countries which still groaned beneath the yoke of aristocratic tyranny. The real motives, however, were the love of adventure and excitement, and the still less justifiable ones of cupidity and self-aggrandizement. The most noted of the filibustering leaders was William Walker, who conducted an expedition against Nicaragua in 1855, and contrived both to make himself master of the country and maintain himself there for nearly two years. He was ultimately expelled by the union against him of the Central American states, and subsequently perished in an attempt to resume his piratical incursions. Another celebrated expedition was that of Lopez to Cuba in 1851, resulting in the overthrow and ignominious death of its leader and many of his associates. An expedition of the filibustering kind to Cuba took place so recently as 1878. The capture of the *Virginian*, an American steamer, carrying men and material to assist the insurgent Cubans, and the execution of a number of those taking part in the expedition by the Cuban authorities, in November of the above year, threatened for a time to produce a serious misunderstanding between Spain and America.

FILICAIA, VINCENZO DA, an Italian poet of the seventeenth century, who successfully opposed the torrent of bad taste which was corrupting the poetry of his native country. He was born in 1642 at Florence, where he began his studies in the Jesuits' College, and afterwards studied at the University of Pisa. His first poetic attempts were verses to his mistress; but deprived of the object of his love by her early death, he resolved never again to sing of a passion, the pleasures of which, he supposed, were vanished from him for ever, and determined to devote his lyre to sacred or heroic subjects. On his return to Florence he was chosen member of the Academy della Crusca, and soon after he married the daughter of a senator, Scipio Capponi, with whom, after his father's death, he retired to the country, and devoted his whole attention to the education of his children and the ease which he loved so well. In this retirement he wrote a great number of Italian and Latin poems; but as his modesty led him to find more fault with them than did the few friends to whom he showed them, they remained unpublished; and he would probably have continued to conceal his splendid talents had not his friends at length revealed the secret. Filicaia had celebrated, in six odes, the deliverance of Vienna from the Turks, by John Sobieski, king of Poland, and the Duke of Lorraine, and the entire defeat of the Turks, which happened soon after. These odes were so much admired that the Grand-duke of Tuscany sent them to those princes. They were printed at Florence in 1684, and Filicaia's fame was thus established as the first poet of his time in Italy. His fortune, however, was little improved by this accession of fame. Queen Christina of Sweden first interested herself in relieving the poet, appointed him a member of the academy of distinguished men which she had founded at Rome, and charged herself with the education of his two sons, on condition that it should not be made known, because she was ashamed to do so little for so distinguished a man. The attention of the Grand-duke of Tuscany was afterwards turned towards him, and one of his sons, who, however, soon died, was received into his service as page. Filicaia was then appointed by him senator and governor of Volterra, and afterwards of Pisa. In the discharge of these offices he gained the love of

the people and the esteem of the sovereign; and notwithstanding the multiplicity of his occupations, he always found time to devote to his favourite studies. His advanced age, and the loss of several of his children, turned his whole thoughts to religious subjects. He undertook, however, the publication of a revised edition of his complete works, but died at Florence, Sept. 24, 1707, at the age of sixty-five. His son Scipio published the collection begun by his father, under the title of *Poesie Toscane di Vincenzio da Filicaia*, and dedicated it to Cosmo III. Another edition, with the life of the poet by Tommaso Bonaventuri, appeared in 1720, and a third, in two volumes (Venice, 1762), which the later editions have followed. Filicaia was particularly successful in the canzoni, and in some of his sonnets;—that, for instance, which begins,

'Italia, Italia, o tu cui feci la sorte
Dono infelice di bellezza, &c.'

is one of the finest poems of the sort, and may sustain a comparison with the best lyric productions.

FILIGREE WORK, a kind of ornamental work in fine gold or silver wire, wrought delicately, and generally more or less varied by the intermixture of grains or small beads of the metal, and of bands, strips, or bars, to give greater strength. An immense variety of patterns can be produced, the wire being made to assume the forms of arabesques, leaf-work, &c., the parts being joined together by gold or silver solder with the use of the blow-pipe. Working in filigree is one of the most ancient and widely-spread arts. Specimens have been obtained from ancient Egyptian, Greek, and Etruscan tombs, and in various parts of Asia articles in filigree have been made from the remotest times down to the present day, as in India and China. Among the Celts, Anglo-Saxons, and Scandinavians, excellent specimens of filigree were early produced, being employed in such articles as bracelets, ear-pendants, brooches, &c. Old Irish filigree work was of especially high quality. The Byzantine workers in filigree were also famous, and the influence of their work was widely felt in Europe during the Middle Ages, books, reliquaries, &c., being ornamented in this manner. At Venice, and in several of the French and German towns, elegant specimens of this delicate art were manufactured as early as the twelfth century. In the seventeenth century the art was carried to its highest perfection in Italy. The Italian peasantry, as well as those of other countries, still produce filigree work for personal adornment; and the Malta filigree is world-famous. The Chinese make most of their filigree of silver, which looks very well, but has not the extraordinary delicacy of some of the Malay and other Eastern work.

FILIPPO D'ARGIRO, SAN, a town in Sicily, in the province of Catania, and 81 miles w.n.w. of the town of that name, near the centre of the island, on a height crowned by a Saracenic castle. This town (the ancient Agryrium), the birth-place of Diodorus Siculus, is noted for the remains of splendid aqueducts. Saffron of good quality, and in great quantity, is grown in the neighbourhood. P. p. 11,616.

FILLAN, ST. Two saints of this name appear in the church calendars.—1. ST. FILLAN, or FAOLAN, the leper, whose annual festival is the 20th June. His principal church in Scotland was at the lower end of Loch Erne, in Perthshire, where 'St. Fillan's Well' was long believed to have wonderful healing properties. In the rock of Dunfillan is a seat known as St. Fillan's Chair, and two carities beside it are said to have been hollowed out by the saint's knees in prayer. His Irish church is at

Ballyhayland (anciently called Killhelan, or Kill-Faelain), in the barony of Cullenagh, Queen's County.—2. *St. FILLAN*, the abbot, son of Feredach, a Munster prince, and St. Kentigerna, of Inchoilleach, in Looch Lomond, flourished in the eighth century. His festival is on the 9th January. His chief church in Scotland was in Strathfillan, the upper part of Glen Dochart, Perthshire. A linn in the river Fillan was believed to work miraculous cures on the insane. The head of his crozier was till 1876 in the hands of the family it had been intrusted to by King Robert Bruce, and is now in the Antiquarian Museum at Edinburgh. The earliest record of the crozier goes back to 1428, when it was in the possession of one Finlay Jore (Dewar), and letters patent issued under James III. in 1487 certify that it had belonged to that family since Bruce's time. About the end of the eighteenth century the owner went to Canada, and for many years the crozier was lost sight of. In 1859 Daniel Wilson the archæologist found it in that country in the possession of a farmer named Alexander Dewar. This farmer sold it in 1876 to the Society of Antiquaries. The head of the crozier proper is of bronze, but it is inclosed in a gilt silver case ornamented with filigree. This relic, called the *Coygerach*, or *Quirich* (a Gaelic word meaning *stranger*), was believed to have special healing virtues, and was infallible in detecting theft. The Antiquarian Museum also contains the abbot's curious old bell, which formerly lay in the churchyard of his church. In 1798 an English tourist carried it off to Hertfordshire, but in 1869 it was recovered by Bishop Forbes of Brechin.

FILLANS, JAMES, sculptor, was born at Wilsontown, Lanarkshire, on 27th March, 1808. He got little education and was apprenticed to a weaver in Paisley, and then to a stonemason. For a long period he had assiduously cultivated during his spare hours his genius for drawing and modelling, and he latterly commenced life as a sculptor. After acquiring some local celebrity in Paisley by his portrait busts, he proceeded to Glasgow. He subsequently visited Paris to improve himself in his art, and in 1836 took up his abode in London. To the Royal Academy exhibition of 1837 he furnished seven busts, including one of Allan Cunningham. His next works were an alto-relievo representing the birth of Burns, and several designs from Burns's poems. He afterwards visited Italy. A life-size group in marble, the *Blind Teaching the Blind*, was exhibited by him in Glasgow, and produced a great sensation. Other admirable works of his are *The Boy and Fawn*, a statue of Sir James Shaw (in Kilmarnock), and a bust of Professor Wilson. He died in Glasgow on Sept. 12, 1852.

FILLET, a small flat band or face, used chiefly to separate mouldings from each other in classical architecture.

FILTRATION. This term is properly applied only to the separation of solid matter in suspension in a fluid by passing the fluid through a substance the pores of which are sufficiently small to prevent the passage of the solid particles. Solid matter in solution is not usually retained under those circumstances, but even this kind of filtration can be also effected to a greater or less extent. The materials of which the filter is composed depend on the kind and quantity of the substance to be filtered. In the laboratory, where filtration is commonly employed to separate small precipitates or crystallizations from fluids, fine white blotting-paper, freed from mineral matter by washing with dilute acid and then with distilled water, is used. A circular sheet of the paper is cut, then doubled upon itself, and the fan-shaped piece again doubled. On opening this out

a cone of paper is obtained, with three folds of the paper on one hand and a single fold on the other. This is fitted into a glass funnel, moistened, and the fluid poured on. Ribbed or creased filters are also employed. Paper, however, cannot be used when the fluids are strongly acid or alkaline. When this is the case, cloth, fine sand, pounded or spun glass, asbestos, porcelain, &c., are found convenient. Cotton is a very good filter for oils or ethereal solutions of the oils and fats.

On the large scale, filtration is specially applied to the purification and aeration of water. The filters at water-works are large tanks or beds, made of good clay and filled with layers of large stones, pebbles, and coarse gravel, fine gravel, coarse sand and fine sand—the fine sand being at the top. Other materials are sometimes utilized, such as furnace cinders or clinkers, shells or shell-sand, and so forth. The water in the reservoir, collected from springs, surface drainage, and rain, is allowed to deposit its suspended matter in settling-tanks, and then it is run into the filters. By percolation the rest of the mineral matter is removed, and the water then flows into the mains which are to convey it to the locality where it is to be used. On the small scale, water is often filtered in small stone filters containing porous earthenware, filtering-stone, or sand; but glass filters have also been introduced, the porous material being gas-carbon or coke. In the refining of sugar the syrup is twice filtered—1st, through long bags, which are woven without seam expressly for the purpose, to remove mechanical impurities, sand, clay, wood, &c.; 2nd, through beds, several feet thick, of animal charcoal (*BONE BLACK*), contained in large iron cylinders, to remove the brown colour. This second filtration is different from the other in so far as the colouring matter is not a suspended solid, but is in solution. Charcoal is highly prized for its decolorizing properties, but it is only one manifestation of the great tendency which it has to absorb substances, whether gaseous, like sulphuretted hydrogen, or solid in solution, like colouring matters, alkaloids, &c. Filtration is applied in various pharmaceutical operations, and in the clarification of oils. Of course after a time the filter becomes choked with the retained matter, and must be either cleaned or renewed. The sand in a water-filter requires renewal in a few weeks or months, according to the purity of the water; animal charcoal is well washed after every charge of syrup, dried, and re-ignited; paper filters can be used only once; and cloth filters or woollen bags, such as those for clarifying jellies, must be thoroughly cleaned, both to take out the impurities and to prevent the fluid acting on the material of the bag, or decomposing and giving it a bad smell. Filtration is sometimes a rapid, but more frequently a tedious operation, as when the solid matter is glutinous and chokes up the pores. To overcome this, various devices are resorted to, all of them tending to increase the difference of pressure on the two sides of the filter. Thus, a siphon, to the shorter limb of which a funnel covered with cloth or paper is attached by the neck, facilitates the passage of the fluid by the difference of hydrostatic pressure; or a tube may be bent twice at right angles, one end furnished with a covered funnel, and the other inserted, air-tight, into a flask containing a little water. By boiling the water briskly the air is expelled, and if, when so boiling, the funnel be immersed in the fluid to be filtered, and the flask be cooled, the condensation of the steam produces a vacuum, and the fluid passes over rapidly to the flask, the solid matter being checked by the cloth or paper diaphragm. A more efficient form of vacuum-filter is that first introduced by Bunsen, of which various modifications have been devised. It consists in

inserting the glass funnel air-tight into a stout flask, by means of an india-rubber stopper, through which also passes a piece of glass tube connected with an exhausting arrangement. By exhausting the air from the flask atmospheric pressure hastens the passage of the fluid, and in this way filtrations can be effected which are in ordinary circumstances impracticable. Various forms of *air-filters*, for freeing air from deleterious gases and other products, have been introduced during the latter half of the nineteenth century. Some of them are specially adapted for railway-carriages, others are intended for filtering the air entering buildings, whilst still others are specially constructed to prevent the poisoning of the atmosphere in the neighbourhood of certain kinds of works. Charcoal, owing to its power of absorbing gases, is of special value in filtering air.

FIN. Fishes are provided with certain members or appendages, whose use is to propel them rapidly through the fluid medium in which they live. These members are denominated *fins* or *pinnæ*, and consist of bony, cartilaginous, or membranaceous rays, supported and held together by an interradial membrane, mostly of a very delicate substance. In some kinds of fish the thick skin which covers the body invests the fins also, rendering the presence of rays evident only by trifling ridges, as in the shark and ray genus. Fishes, in general, possess five kinds of fins, which are divided into two groups, paired fins, the pectorals and the ventrals; and mesial fins, the dorsal, anal, and caudal fins. The paired fins are homologous with the limbs of the vertebrates, the pectoral corresponding to the anterior or upper, the ventral to the posterior or lower limbs. The mesial or vertical fins are placed in the middle line, and do not represent limbs: they have no counterpart save in the mesial fold of integument in newts and tadpoles:—1. The *pectoral* or breast fins are never more than two; they are placed immediately in the rear of the gill, opening on the shoulder. In a state of rest these fins are parallel with the body, and the apex towards the tail. 2. The *ventrals*, or abdominal fins, are placed under the throat or belly, and point backwards. They are smaller, in general, than the pectorals, and have sometimes long appendages, as in the *Ophronemus* or *goramy*. In the gurnard pectoral appendages also occur. 3. Those of the back, which are therefore denominated *dorsal*, varying in number from one to four, to which sometimes are added several finlets or *pinnulae*—small appendages which are seen in the mackerel. 4. The *anal* fins are situated behind the vent, varying in number from one to three, placed vertically, and, like the dorsal, generally deeper on the anterior margin. Lastly, 5. The *caudal*, or tail fin, terminating the body, and serving as the rudder by which the fish steers itself. By means of the dorsal, anal, and ventral fins, the body of the animal is sustained in a vertical position in the water, while the pectorals and caudals are used in propelling it forward; in which it is also aided by the action of the tail. Naturalists have availed themselves of the position of the fins to construct divisions in the class of fishes, and minor characters are drawn from the substance of the fins, whether soft, spiny, or both, as is the case in the majority of fishes. Attached by interspinous bones to the spines of the vertebrae, the fins possess great power. The muscles which move them are very strong, and by a peculiar arrangement they are enabled to erect the spines immovably at will, which is observed when fishes are taken by the hook. Sometimes spines occur separate from the fin, as in the *Gasterosteus*, or stickle-back. Severe wounds are inflicted by the spiny processes of the fins of fish, and poisonous effects are attributed to many of

them, although without much ground. In the case of the sting-ray and a few others, the dangerous wounds which have been received by incautious fishermen abundantly testify to the serious effects of a venomous fluid secreted by the skin. In the *Xoostus*, or flying-fish, the pectorals are enlarged sufficiently to serve as wings, by which the animal sustains itself for several seconds in the air. In the suckers, or *Cyclopterus*, the ventral fins are united in a circular disk, or sucker, by which the fish attaches itself to rocks very firmly. Perhaps the most singular use to which the whole set of fins is applied occurs in the climbing-perch, a fish, which, in the most extraordinary manner, leaves its native element, and, by means of the spinous portion of its fins, absolutely ascends the trunks of trees several feet, and conceals itself in the collections of water at the base of the leaves of certain palm-trees. In colour and size the fins of fish present the greatest variety, affording excellent characters for distinguishing the species. For the arrangement depending on their number and position, see **ICHTHYOLOGY**.

FINALE, the concluding part of a musical composition; for instance, of a quartetto, of a symphony, of any act of an opera, of a ballet, &c. It consists of compositions of various characters. The finale, in instrumental pieces, has mostly a character of vivacity, and requires a quick movement and lively performance. In the opera the finale usually consists of a series of compositions for many voices, and of different character and different time and movement.

FINCH. This numerous family of birds embraces not only some of the most beautiful, but also some of the most agreeable of the feathered tribe. It forms the genus *Fringilla* of Linnaeus, which has since been much subdivided by modern ornithologists.

Among the most celebrated is the goldfinch (*Carduelis elegans*; *P. carduelis* of Lin.). This is the most esteemed of the hard-billed birds, for the colours of its plumage, the elegance of its form, and the harmony of its notes. The bill is white, tipped with black, and surrounded at the base with a ring of rich scarlet feathers. The head is covered with large spots of black and white; the back, rump, and breast are of a pale, tawny brown. When the wings are folded they display a row of white spots, finely contrasted with the black ground on which they are placed. These are the tips of the wing-feathers, which terminate in white. This bird is a native of Europe, where it remains during the winter. It begins its warbling about the beginning of March, and continues melodious throughout the whole spring. In winter it assembles in large flocks, and feeds upon seeds of different kinds, particularly those of the thistle. It prefers orchards as a residence. The nest is an intricate but beautiful structure, the outside being composed of moss, lichen, and coarse grass, lined with hair, wool, and swallow down. The female goldfinch will sometimes pair with the canary. The females lay five white eggs, marked with spots of a deep purple colour at the larger end. They feed their young with caterpillars and insects. When kept in a cage they will sing the greatest part of the year. In a state of confinement they become very docile, and can be taught a variety of little tricks.

The canary-bird (*P. canaria*) is the most remarkable and melodious of the finch tribe, and, next to the nightingale, has been most celebrated for its musical powers. In a wild state it is chiefly found in the Canary Islands, but has become so common in a state of captivity that its native habits and country have been almost forgotten. It is uncertain at what period these birds were introduced into Europe, but probably not till about the fifteenth century. Belon, who wrote in the sixteenth, makes no mention

of them. Gerner and Aldrovandus speak of them as so great rarities that they could only be purchased by people of high rank. They are now bred in great numbers, and have become so common that they are of little comparative value. More than twenty-seven varieties were enumerated before 1718, and by careful selection a still larger number now exists; but the majority of the differences are in colour and markings. The Belgian variety differs, however, also in form, being even 3 inches longer in the body than the wild bird, which is 5 inches long. In their native state they are of a dull and uniform green, and exhibit none of that richness and variety which are so much admired in the tame ones. Hybrids have been obtained by crossing with at least nine other finches, and several of them are almost completely fertile; but we have no evidence that any distinct breed has originated from such crosses. Like the rest of the finch tribe they have a high, piercing note, which they continue for some time in one key without intermission, then raise it higher and higher by degrees. This note is variously improved by education; for this bird, being more easily reared than most others, and continuing its song much longer, has had much attention paid to it. Numbers of treatises have been written on the rearing and education of these birds, which we have not space to analyze. Let it suffice that in Germany and the Tyrol, from whence the rest of Europe is principally supplied, the apparatus for breeding canaries is both large and expensive. A large building is erected for them, with a square space at each end, and holes communicating with these spaces. In these outlets are planted such trees as the birds prefer. The bottom is strewn with sand, on which is cast rape-seed, chickweed, and such other food as they like. Throughout the inner compartment, which is kept dark, are placed brooms for the birds to build in, care being taken that the breeding birds are guarded from the intrusions of the rest. Besides being bred in Tyrol and various parts of Germany, many canaries are bred in Switzerland and Belgium. In Germany it is estimated that two millions are reared annually, half being exported.

Linnet (*Linota cannabina*).—This plain but melodious little bird is common to all parts of Europe. It is about 5½ inches in length, of a dark reddish-brown colour on the upper parts, and a dirty reddish-white beneath. It builds its nest in low bushes; the outside is made of dried grass, roots, and moss, lined with hair and wool. The female lays four or five eggs, of a pale blue colour, spotted with brown at the larger end, and generally breeds twice in the year. The song of the linnet is sweet and varied; its manners are gentle and docile; it easily adopts the song of other birds when confined with them, and, in some instances, has been taught to pronounce certain words. During the winter it is frequently found in large flocks. It feeds on various kinds of seeds, and has derived its name from its partiality for the seed of flax (linseed).

The following is a brief outline of the finch family as that term is now used, and though almost every writer has his own classification, the reader will see the general relations of the group:—Family *Fringillida*. Sub-family *Emberizina*, the Buntings. Sub-family *Loxia*, the Crossbills. Sub-family *Pyrrhulina*, the Grosbeaks. Sub-family *Fringillina*, under which sub-family are included: 1, *Coccothraustes*, the Green and Haw Finches; 2, *Fringilla*, the Finch proper with its sub-genera: *a*, *Carduelis* (*C. elegans*, Goldfinch; *C. spinus*, Siskin); *b*, *Linota* (*L. cannabina*, Common Linnet; *L. linaria*, Lesser Redpoll; &c.); *c*, *Citrinella*, Citril Finch; *d*, *Fringilla* (*F. caelebs*, Chaffinch, &c.); *e*, *Montifringilla*, Mountain Finch or Brambling. Sub-family

Spizellina, an American group, the Bunting Finches, as the Tree Bunting Finch (*Spizella*); the Prairie Bunting Finch (*Passerculus savanna*), and the Shore Finches (*Ammodramus*). Sub-family *Pipylina*, or Parrot Finches, also chiefly an American group, under which come the Reed Finches (*Donacopis*). The Virginian Cardinal Finch (*Cardinalis virginianus*).

FINCH, HENRAGE. See NOTTINGHAM (EARL OF). **FINDEN, WILLIAM**, a celebrated engraver, born in 1787, was originally bred to the occupation of engraving shop-bills, cards, and similar matters; but having cultivated a taste for the higher departments of art, became famous as a book illustrator, one of his first successes being his engravings of Smirke's illustrations of Don Quixote. In partnership with his younger brother Edward he commenced the publication of several extensive series of engravings, the first and most successful of which was the Byron Gallery. Other series followed, including the Gallery of British Art, 1838–40. It however proved a most disastrous undertaking, from the expensive scale on which it was carried on, depriving him ultimately of all the profits which he had amassed by his former labours. Though he still laboured diligently at his profession, his spirit was broken, and he accomplished no further work of distinguished merit. He died on 20th September, 1852. Besides his book-plates, Finden has produced some celebrated large engravings, among which may be mentioned his Village Festival and Highlander's Return, from Wilkie's pictures, and a portrait of George IV., after the picture by Sir Thomas Lawrence. For this last he received the sum of 2000 guineas.

FINE (probably from Latin *finis*), in English law, formerly signified 'an income or a sum of money paid at the entrance of a tenant into his land; a sum paid for the renewal of a lease; and an assurance by matter of record founded on a supposed previously existing right. In every fine which was the compromise of a fictitious suit, and resembled the *transactio* of the Romans, there was a suit supposed, in which the person who was to recover the thing was called the plaintiff, co-accusee, or recognizee, and the person who parted with the thing the deforcant, co-accuser, or recognizee. It was termed a fine for its worthiness, and the peace and quiet it brought with it' (Wharton's Law Lexicon). Fines upon land were abolished by 3 and 4 Will. IV. cap. lxxiv. (For the origin and purpose of the statute of fines see Hallam's Constitutional History of England, vol. i. ch. i.) Besides the specific uses above referred to, fine has the signification in general law of a pecuniary penalty exacted either in punishment of, or in compensation for, an offence, whether committed against an individual, in contravention of the laws of the community, or against the community itself. Fines in this sense are of very ancient origin, and have been sanctioned by the practice of all nations, ancient and modern, from the lowest to the highest degree of civilization.

In the earlier stages of society fines form, for an obvious reason, one of the principal modes of punishment. Prisons and artificial restraints impose a burden on society which it is not yet able to bear, and demand an organization which it has not reached. There remain only fines, corporal chastisements, and death. The last is suited only for the gravest offences; the second is rendered impracticable in the case of many offences by the dignity of the offenders; the first in many others by their impecuniosity. Hence arises, at a very early stage of social development, that distinction so often complained of as a later corruption, of one law for the rich and another for the poor, the latest form of which is the modern alternative of fine or imprisonment. The practice of imposing fines in commutation even of the pain of death

has been found in rude societies too frequently, and under too many diversities of circumstances, to admit of its being referred to anything but the common necessities of their situation, and the influence in such societies of powerful individuals or classes.

In the most civilized nations of antiquity, Greece and Rome, fines were numerous and frequently excessive. Miltiades, the hero of Greece, being intrusted after the battle of Marathon, at his own request, with seventy ships for a secret purpose, attacked the island of Paros, where he is said to have had a private revenge to gratify, but was repulsed and compelled to return to Athens without accomplishing his object. Being impeached by Xanthippus, and condemned for deceiving the people, the penalty was commuted to a fine of fifty talents, the cost of the equipment of the fleet with which he had been intrusted. The fine was paid by his son Cimon. In the early period of the existence of Rome fines were imposed in cattle, the highest amount of the mulcta or damnum being two oxen and thirty sheep; when coined money came into use, an ox was valued at 100 asses (see *As*) and a sheep at 10, so that the maximum fine would amount to 500 asses. The estimation of fines in cattle was continued down to the time of Trajan, but their maximum limit was extended. The ancient Germans, being a people who highly valued freedom, admitted hardly any punishment but fines, and their influence extended the use of this penalty among other European nations. A murder was commuted by a payment to the family of the deceased. In the ancient French law fines were divided into two classes, according as they were fixed by law or left to the discretion. This distinction has been abolished since the revolution by the fixing of maximum and minimum limits for all fines.

In England the common law recognizes fines, but does not determine their amount, and this is usually fixed in particular statutes, with a discretion to the judge. The rule in England from an early period, and which was incorporated in Magna Charta, was that no man should be amerced beyond his circumstances and personal estate, leaving to the landowner his land, to the merchant his stock, and to the husbandman his wainage or team and instruments of husbandry. This rule was not always observed, and we have in the Bill of Rights (which see) a stipulation that excessive fines shall not be imposed. The recovery of fines in Great Britain is provided for by Act 32 and 33 Vict. cap. xlix., passed 2d August, 1869.

FINE ARTS. See *ARTS*, and the different articles on the various branches of the fine arts.

FINGAL. See *OBSEAN*.

FINGAL'S CAVE. See *STAFFA*.

FINGER-BOARD, the part of a stringed instrument, as the neck of a violin, guitar, &c., to which the fingers (of the left hand) are applied in playing to stop the strings. The finger-board of a keyed instrument (played with both hands) is commonly called a *key-board*.

FINGERING, disposing of the fingers in a convenient, natural, and apt manner in the performance of any instrument, but more especially of the organ and pianoforte or harmonium. Good fingering is one of the first things to which a judicious master attends. It is, indeed, to this that the pupil must look as the means for acquiring a facile and graceful execution, and the power of giving passages with articulation, accent, and expression. The following remarks apply especially to the pianoforte. Good fingering may be said to consist in two parts, the holding of the hands and fingers in the right position over the keys to give due command both of fingers and wrists in execution, and the proper disposition of the

fingers upon the notes to facilitate movement from one position to another. The former of these will probably be thought by the uninitiated by much the easier of the two; it is in reality the more difficult, and so far from being a merely initiatory part of the art, it is one to which the attention of the pupil, throughout his progress, must be incessantly directed. It implies the power of recovery—that is, of withdrawing each finger from the note into its normal striking position, for it is evident that if there is a position of the fingers which in beginning to play facilitates the reaching of the notes, the same position, allowing for the movement of the hands along the key-board, will facilitate it throughout. Nothing, however, is more common than the violation of this rule. Performers of considerable experience may be seen with their fingers flying about in a way that makes it wonderful, even to a casual observer, how they ever reach the notes at all. The cause of this is easily explained. In striking, the position of the hand is disarranged. When the third finger, for example, is pushed against a note, the muscular action causes the fourth to fly into the air, when the second is struck the third and fourth fly up, and so on. A smooth and even style, which is the groundwork of all artistic expression, can never be acquired in this mode of performance. The hand must be held evenly over the key-board, with all the fingers curved by bending both the first and second joints, so as to bring the points of the fingers nearly perpendicularly over the notes, and not at too great a distance. The hand may be more or less spread, according to the nature of the passage. This is the normal position. In striking the notes the power must be acquired of moving each finger independently, so that whatever notes may be struck the remaining fingers may retain their normal position. The force of the stroke comes from the partial straightening of the finger in striking, and especially in striking chords, from the action of the wrist. In striking a chord repeatedly and rapidly the striking fingers should, after the first stroke, be held immovable, and the action of striking be given entirely from the wrist. The stroke should be given with the fleshy tip or front of the finger, in which the sense of touch is most acute, and to secure this the nails should be kept short. In leaving the note, to secure a proper recovery, the fingers must be lifted from the knuckle-joint, while the first and second joints are employed in recovering the normal position. This must commonly be done simultaneously with the striking with other fingers. A full-grown hand can usually strike an octave while holding the thumb and fourth finger slightly curved, which should always be done, the intermediate fingers being still kept bent and slightly elevated, so as not to interfere with the free action of the hand. In moving the hand in running passages the thumb is passed under the second or third finger. This will be found in elementary books of instruction, and it is only mentioned here to say that the thumb must be well pressed in to reach its position freely, and as soon as the second or third finger is released the hand must be rapidly and smoothly passed to its new position. A good action of the hands depends very much on a careful attention to this turning movement. Indeed all the fingers must in turn be made fixed pivots on which the position of the hand may turn, and should be so used that the striking finger may be brought directly over the note to be struck. The knowledge of any mechanical art depending on muscular exertion will greatly facilitate the progress of the pupil in learning fingering. Those who possess this knowledge will understand that attitudes and movements at first apparently impracticable are, when the necessary muscular freedom has been

acquired, the most easy, free, and natural. The acquisition of the combinations of fingering is purely a matter of mechanical knowledge. They are very varied and extensive, and it requires considerable time to master them, but there is at the present day no impracticability in a pupil's doing this without tutorial assistance. If the art of fingering can be acquired thus, the knowledge of it certainly may. Elementary treatises may be had in abundance, which explain its first principles; and a sufficient number and variety of pieces, fingered by competent masters, can be procured to form the judgment of the pupil, and enable him to act independently.

FINGERS AND TOES, a disease or malformation in the bulb of the turnip, which, instead of swelling, throws out various knobby appendages. It is caused by a plant of the group *Myxomycetes*, a kind of fungus called by naturalists *Plasmodiophora Brassicae*. Lime acts both as a preventive and as a destroyer of the disease. Finger-and-toe is also known as anbury, club-root, and canker, and is sometimes found on other plants than the turnip.

FINIAL (architecture), the bunch of foliage which terminates pinnacles, canopies, pediments, &c., in Gothic architecture.

FINING. See CLARIFICATION.

FINISTERE, or **FINISTERRE** (Land's End), a department of France, so named from occupying its westernmost extremity; bounded *n.* by the départements Côtes-du-Nord and Morbihan, and on all other sides by the sea; area, 2595 square miles. The coastline is bold and precipitous, composed almost throughout of lofty granite cliffs, in which the violence of the waves has made numerous deep indentations, the two most important of which, both on the west, form the extensive bay of Douarnenez and the famous roadstead of Brest. The interior is traversed by two chains of hills: the more northern called Mount Arré, the other chain known by the name of the Montagnes Noires or Black Mountains. These chains send out numerous ramifications, which extend in all directions, and give the whole department a very hilly appearance. In some parts it looks bleak and desolate, as in the arrondissement Châteaulin, where are those extensive tracts, almost barren, known by the name of Landes; but in many other parts the scenery is rich and beautifully diversified. The number of streams is very great; but the only navigable rivers are the Aulne, Elora, and Odet. An important addition to the water communication is the canal which connects Brest with Nantes. The climate is more equable than that of the interior of France, the range of the thermometer being much more limited. Winds, more or less west, blow during three-fourths of the year, and often with great violence. Owing to the rocky nature of the surface scarcely one-half of the whole is available for cultivation, and much more than one-third is waste. The arable land, however, is of good quality, and well cultivated; and a considerable surplus of grain is left for export. The principal crops are wheat, rye, and oats. Potatoes and flax are also extensively grown, and from the produce of the orchards a good deal of cider is made. The domestic animals are generally of good breeds. The fisheries on the coast are extensively carried on, and that of sardines is particularly valuable, employing a great number of hands. The minerals are of considerable importance, including iron, zinc, bismuth, and lead. The mines of the last, at Poulkaouen and Huelgoat, are considered the most productive in France. The manufactures consist chiefly of sail-cloth, ordinary linen, soap, oil, candles, ropes, leather, paper, and tobacco. Ship-building also is carried on to a large extent. The trade, greatly favoured both by inter-

nal communication and a number of good harbours, is extensive. For administrative purposes the department is divided into five arrondissements—Quimper, the capital; Brest, Châteaulin, Morlaix, Quimperlé; subdivided into forty-three cantons and 290 communes. Pop. (1896), 728,590; (1901), 783,193.

FINISTERRE, CAPE (Latin, *Promontorium Celticum*), the most western cape of Spain, on the coast of Galicia, 42° 54' *n.* lat.; 9° 21' *w.* lon. The highest peak of the mountain, of which the cape forms a part, is 1917 feet above the sea; it may be seen 17 leagues out at sea.

FINLAND, a grand-duchy united to Russia, containing 144,255 square miles, and divided into eight governments or counties. It consists of three parts:—1. That part of Finland ceded by Sweden to Russia by the Peace of Abo in 1743, and by the Peace of Nystad in 1721; 2. That part which was ceded by Sweden at the Peace of Fredrickshamn in 1809, including all the rest of Swedish Finland; and, 3. That part of East Bothnia and Lapland ceded by the same peace. It is bounded *n.* by Norway, *e.* by the Russian governments of Olonetz and Archangel, *s.* by the Gulf of Finland, *w.* by Sweden and the Gulf of Bothnia. The capital is Helsingfors, a handsome town with 54,000 inhabitants. The most important lakes are Lake Enara, Lake Ulea, Lake Saima, and in part Lake Ladoga. The Tornea, the Kumo, the Kymmene, the Kemi, and the Ijo are the most important rivers. Though a great portion of the soil is unfit for agriculture, some parts are fertile in grain, potatoes, and flax, and good for grazing. In addition to timber, chiefly fir, large quantities of tar, pitch, and rosin are obtained from the forests. The principal minerals are iron and copper. The granite quarries yield blocks of great size, such as the obelisk monolith erected to the Emperor Alexander at St. Petersburg. The climate of Finland is milder than most countries of the same latitude owing to its proximity to the sea. There are no high mountains, and the interior is covered with thousands of lakes, which occupy 10 per cent of the surface, whilst 20 per cent is taken up by bog and moor, and 60 per cent by forests. Finland has over 1300 miles of railway, and the whole country is well provided with telegraphs and telephones. Agriculture, forestry, and fishing are the chief occupations of the Finns. The population is densest on the coasts; the interior of this extensive country is very thinly peopled; while some parts in the extreme north are incapable of supporting a dense population, on account of the cold. The strong fortresses of Finland render it very important for Russia. The inhabitants are mostly Finns and Swedes (see FINNS), with a few Russians and Germans. Up to the twelfth century the Finns lived under their own chiefs, and were pagans. Their conversion to Christianity took place about the middle of that century, after their conquest by the Swedes. They are almost all Lutherans. They are somewhat phlegmatic in temperament, but patient, laborious, not without enterprise, and very hospitable. In 1721 the part of Finland which formed the province of Wiborg was secured to Peter the Great by the Treaty of Nystad. The remainder was conquered from the Swedes in 1809, and now forms a division of the Russian Empire, under the name of a grand constitutional duchy, the emperor exercising his supremacy as grand-duke. The states, composed of the representatives of four social orders, *i.e.* nobles, clergy, burghesses, and peasants, are convoked by him; and no new laws can be enacted, nor new taxes imposed, without their sanction. These four orders form the Diet, which meets every few years for the transaction of business. The imperial Finnish senate (composed of twenty Finlanders nominated by the

emperor and grand-duke) constitutes the governing body of Finland. The Governor-general of Finland, who represents the emperor, is president of the senate, usually a Russian, and is appointed by the emperor. The ordinary procedure of the courts of law is in accordance with the forms in existence under Swedish rule. In recent years the Russians have introduced various measures with the object of Russianizing the country as far as possible, thus causing great discontent. The actual seat of government is at St. Petersburg; but the Governor-general of Finland resides in Helsingfors. Pop. (1896), 2,520,437.

Finnish Language and Literature.—The language of the Finns (Finnish or Chudic) belongs to the northern division of the Ural-Altaic family of languages, and is most nearly allied to the languages of the Esths, Lapps, Mordvins, Voguls, and Hungarians. It possesses all the German vowels, *a, e, i, o, u, a, o, u*, which again give eight double vowels and twelve diphthongs. Like the other Altaic languages it adheres to the 'law of harmonic sequence of vowels,' according to which the vowels are divided into the two classes, heavy (*a, o, u*) and light (*e, i, &c.*), and only vowels of the same class can occur in the same word. The language is remarkably rich in declensional forms, there being as many as fifteen different cases expressing such relations as are expressed in English by *near, to, by, on, in, with, without, along, &c.* By this means these cases are made to express the relations of space, time, cause, &c. There is no distinction of gender in Finnish nouns. The possessive pronoun is indicated by suffixes. The verb resembles the noun in its capability of taking on different shades of meaning by corresponding modifications, and is in this respect a remarkable philological phenomenon. The Finnish proper is divided into three principal dialects, the Karelian or eastern; the Savo in central Finland; and the Tavastian in the west. This latter was used in the original translation of the Bible, and thus became the parent of the literary Finnish.

Finnish literature is valuable chiefly for its rich stores of national poetry, which has been collected only in modern times. The old and popular poetry of the Finns, as it appears in the various *runor* or ballads, is governed by rules of 'quantity' as in that of the Greeks and Romans, not by accent; rhyme only occurs rarely; alliteration is employed as a rule. These poems, which had been preserved by oral tradition, were collected by Lönnrot, and in 1835 he published them, under the title of *Kalevala*, with a second enlarged edition in 1849. He also published in 1840 *Kanteletar*, a collection of 592 ancient lyric poems and 50 old ballads, the *Suomen kansan sanaleikkuja* (1842), a treasury of 7077 popular proverbs; and *Suomen kansan arwittuksia* (1844), a collection of 2188 riddles. Another work that deserves notice is *Eero Salmelainen's* collection of legends and stories in prose, *Suomen kansan satuja ja tarinoita* (four vols. 1854-62). The first book in the Finnish language was printed at Abo in 1544, its author being Michael Agricola, afterwards bishop of Abo, who also translated the New Testament and part of the Old into Finnish. A complete Finnish Bible appeared in 1642. Lönnrot's Finnish-Swedish dictionary has been published by the Finnish Literary Society, and Dr. Donner has a dictionary of the Finno-Ugric languages in German. Finnish is becoming more and more the vehicle for imparting instruction. There are many establishments for the higher education of both sexes in which the Finnish tongue is used, and about half of the 800 students at Helsingfors University speak Finnish. Works on science and history, as well as poetry, have been written in Finnish in recent times, and there are now a considerable number of Finnish newspapers.

FINLAND, GULF OF, a great arm of the Baltic, on the east side, having Finland on the north, and the Russian governments of Esthonia and St. Petersburg on the south. The length of the gulf from east to west is about 250 or 260 miles; breadth at the entrance or narrowest part, 40 miles; towards the head, where it is widest, about 80 miles. It receives but few rivers, and none of them, with the exception of the Neva, which enters it at its upper extremity, of any great size. It contains numerous islands, of which Cronstadt is the largest. There are various towns of considerable importance along its shores, St. Petersburg occupying its E. extremity. Amongst them may be mentioned Narva, Revel, Port Baltic, Borgo, Ekenas, Fredricksham, Helsingfors, and Viborg.

FINMARK (Danish and Swedish, *Finnmarken*), a bailiwick in Norway, province of Tromsø, forming the most northern part of the kingdom; bounded, E. by Russia, S. by Sweden and the bailiwick of Nordland, and on all other sides by the Arctic Ocean. It consists of a mountainous and usually sterile tract, stretching 140 miles north-east to south-west, with an average breadth of about 40 miles; its coast deeply indented by bays and lined by numerous islands. Both the severity of the climate and the general barrenness of the soil confine cultivation within very narrow limits. Where it is practicable the chief crops raised are barley and potatoes. The only trees are birch and pine, and occasionally willow and mountain-ash. The principal rivers are the Tana, forming the Russian boundary on the east, and the Alten. The valley of the latter is the finest part of the country, and presents some fine Alpine, and even rural scenery. The islands already mentioned, known by the general name of Loffodens, form a long line of coast where important fisheries are established. The cod-fishery employs a large number of boats and men, and a great quantity of cod liver oil is made. Whales are occasionally caught off the coast. The inhabitants are Finns and Laplanders; they lead but a miserable life; they have very little grain, and often exist upon moss-bread and cakes made of the bark of young pine-trees. Pop. (1900), 32,736.

FINNS, in their own language called *Suomalainen*, and by the Russians *Chudes*, are in the narrower sense a race of people inhabiting the north-west of European Russia (governments of Archangel and Olenetz), but especially the Grand duchy of Finland. In a wider sense Finnic is the name applied to one of the five chief branches of the northern or Ural-Altaic family of peoples and languages. These peoples were formerly spread over the whole north of Asia and north of Europe, and they are divided into the five families, the Tungusic, Turkic, Mongolic, Samoidic, and Uralo-Finnic or Finnic family proper. The last or most westerly family still forms the population of North Europe and North-west Asia, and formerly covered the greater part of Scandinavia. It is again divided into four groups or branches: 1, the Ugric, to which the Ostiaks, Voguls, and Magyars belong; 2, the Bulgaric or Volgaic, consisting of the Tcheremisses and the Mordvins; 3, the Permian, composed of the Permiens, Sirians, and Votjaks; and 4, the Chudic or Baltic group. To the last belong, besides the Finns proper, the Esths of Esthonia and the LIVES or LIVONIANS, the Chudes (in the narrower sense), i.e. Karelians, Vepses, and Votes, in the governments of Novgorod and Olenetz, and the Lapps in Archangel and the northern parts of Finland, Sweden, and Norway. The Finns proper are divided into two branches: the Tavastians in the south-west, and the Karelians in the east of Finland. The Finns may probably be identified with the Scythians, and their earliest seats appear to have been

the Ural Mountains and the neighbourhood of the Caspian Sea. They originally led a peaceful nomadic life, but subsequently practised agriculture and adopted settled habits. They seem to have been compelled to migrate more to the north-west about the beginning of the Christian era, by the pressure of the Gothic tribes, and the country west of the Ural Mountains, more particularly the region where the Great and Little Volga unite, became their second home. From this the bulk of them had again to remove to their present abodes, though considerable numbers were left on the Volga, Oka, Kama, about the sources of the Dwina, in the Ural, and others again spread eastward, some of them as far as the Altai Mountains.

FINSBURY, a parl. bor. of England, locally in Middlesex, but included in the administrative county of London. It now forms three divisions, each returning one member: (1) the Holborn division, embracing Holborn, St. Giles, Gray's Inn, Furnival's Inn, Staple Inn, and Lincoln's Inn; (2) the Central division, embracing the parish of St. James and St. John Clerkenwell; (3) the East division, embracing the parishes of St. Luke and St. Sepulchre, with the Charterhouse and Glasshouse Yard. Finsbury, comprising the East and Central parl. divs., is one of the London boroughs under the act of 1899. Pop. of parl. bor. (1891), 182,454; (1901), 165,865; of mun. bor. (1901), 101,476.

FINSTERWALDE, a town of the German Empire, in the province of Brandenburg, Prussia, 40 miles north of Dresden, with flourishing manufactures of cotton and woollen cloths. Pop. (1895), 9661.

FIORD, a geographical term (of Scandinavian origin) applied to long, narrow, and very irregularly shaped inlets of the sea such as diversify the coast of Norway.

FIR, in the narrower and stricter sense of the word, is the name of a genus of trees which belong to the order Conifera, and the sub-order Abietines, having solitary leaves growing round the branches. The fir is thus distinguished from the *pine*, the leaves of which grow in twos, threes, fours, or fives; and from the *cedar* and the *larch*, both of which have the leaves fasciculated. The term fir, thus limited, is applied only to the different varieties of the *silver fir* and the *spruce fir*. The silver firs are distinguished by having the cones erect, scales deciduous, and leaves flat. The common silver fir is the *Abies picea* of botanists, the *Pinus picea* of Linnaeus. It is a native of the middle and south of Europe. The finest trees of this species are found in southern Italy; but the largest forests are those on the slopes of the Pyrenees, especially on the French side. It always prefers mountainous regions, and is sometimes found at a height of nearly 6000 feet. The height of the trunk is sometimes 150 feet, and the diameter above 6. It is the *sapin* of the French, and the *abies* of the ancient Romans. It is from this tree that Strasbourg turpentine is procured; and its wood is of great use in ship-building (for masts, yards, and spars), in house-carpentry, &c. To this genus also belong the *Abies nobilis*, a large and beautiful tree discovered in Northern California, by Mr. Douglas, and found also in British Columbia; the *Abies Sibirica*, found on the Altai Mountains; and the *Indian silver fir*, a native of the slopes of the Himalaya Mountains. The *Abies balsamea* or balm of Gilead fir, and the *Abies Canadensis* or hemlock spruce fir, also belong to this genus. The spruce firs have the cones pendulous, scales persistent, and leaves tetragonous. Of this division the common or Norway spruce fir (*Abies concolis*) is the most important. It gets the name of the Norway spruce from the fact that in that country it constitutes the principal

timber; but it is also extensively cultivated in the middle of Europe, and is found all over Siberia to the seventieth degree of N. lat. The average height of the tree is from 80 to 150 feet; and it attains its maturity in about seventy or eighty years. The branches, regularly arranged round the main stem and gradually diminishing towards the top, give the tree a pyramidal form. Nearly every part of this tree is of use. The wood (white or Christiana deal) is adapted to various ordinary purposes; the longest and thinnest stems are very valuable in ship-building for making masts; and the stems of those trees that are found at a great height, and in which accordingly the yearly rings are very narrow, are eagerly sought by musical-instrument makers for sounding-boards. The bark is used in tanning; the young buds or shoots are used in making the drink known as spruce beer; and the resin which exudes from the tree supplies the common frankincense, and the Burgundy pitch of commerce. The so-called *Scotch fir*, being really a pine, will be found noticed under the article *PINE*.

FIRDUSI, or **FIRDAUSI**, **ABUL KARIM MANSUR**, the greatest epic poet of the Persians, was born in Khorassan about 939, and died about 1020. His curiosity was excited and gratified by the ancient history of Persia, and he determined to adorn it with the charms of verse. On account of some difficulties he went to Ghizne (Ghazna), where the sultan Mahmud then held his court, and attracted and collected the poets and learned men by his patronage. He entered the gardens of the royal palace and found Anasari, the poet of the sultan, in one of the arbours with two of his disciples, engaged in making extempore verses. Firdusi approached them and joined them in their occupation. Anasari, astonished to hear a stranger, in peasant's clothing, express himself with so much elegance, entered into conversation with him, discovered the purpose of his visit, and informed the sultan. Mahmud afterwards ordered him to finish the Persian work, the ancient *Shanameh* or *Bastanemeh* (literally, The Old Book), which contains the history of Persia, and which had been begun by Dabiki, promising him a piece of gold for each verse. Firdusi devoted a large number of years to this work, and produced an historical poem of 60,000 verses, entitled *Shanameh* (Book of the Kings), containing the history of the Persian rulers from the beginning of the world to the downfall of the Sassanian dynasty (632 A.D.), and consisting properly of a succession of historical epics. The achievements of the hero Rustam, the Persian Hercules, form one of the finest episodes. Firdusi presented his poem to the sultan, and was to receive his reward, but the envious vizier instead of a gold piece gave him only a piece of silver for each verse. Indignant at this treatment, Firdusi struck out a number of verses in praise of Mahmud, which he had inserted in his poem, and composed a bitter satire on the sultan (to be found in Jones' *Poeseos Asiaticae Commentarii*). Compelled to flee he retired to his native town of Tus, where he lived in concealment. Meantime Mahmud, became sensible of his injustice, and having ascertained that Firdusi was still alive and in want, he ordered twelve camels, loaded with rich presents, to be sent to the poet. They arrived at the door of his house as his corpse was brought out for burial. The *Shanameh* is one of the finest Asiatic poems. No work in the Persian language can be compared with it. It is inestimable as a history, although as yet but little used. A good edition of the text is that of Captain Turner Macan (Calcutta, 1829), with a glossary. There is no complete English translation. An abridged translation in prose and verse, by T. Atkinson, was published in 1831, and there are several other translations

of portions. A French translation, by Mohl, was published in 1838-78 (7 vols. folio), along with the Persian text.

FIRE. See COMBUSTION and HEAT.

FIRE ANNIHILATOR, FIRE EXTINGUISHER, names given to certain apparatus intended to extinguish fires. In the widest sense of the term any kind of fire-engine may be called a fire-extinguisher, but it is usual to confine the latter name to portable apparatus acting by the forcible ejection of water or incombustible gases. In some of the many contrivances of this kind the force required to expel the water is produced by the reaction on one another of chemicals brought into contact when the apparatus requires to be used. The chemical action gives rise to a gas, or mixture of gases, which presses on the surface of the water and thus forces it out through any opening that may be provided. The earliest of modern fire-extinguishers seems to have been that invented by W. A. Graham, of Virginia, about 1837. It consisted essentially of a contrivance by means of which carbonic acid gas dissolved in water under pressure could be liberated and directed upon burning objects. Many subsequent improvements have made Graham's fire-extinguisher more useful. The Babcock extinguisher consists of a vessel filled with a solution of bicarbonate of soda. In the upper part of the vessel there is a smaller one containing sulphuric acid, suspended by pivots below its centre. When not in use the inner vessel is kept upright by a rod passing through the stopper of the larger vessel, but in case of fire the rod is withdrawn, thus permitting the inner vessel to topple over and mingle its contents with the bicarbonate of soda. The result, of course, is that carbonic acid gas is at once liberated. Many automatic fire-extinguishers, intended to be brought into operation by the rise of temperature caused by fire, have been used with more or less satisfactory results.

FIRE-ARMS, a general term for all sorts of cannon, guns, rifles, fowling-pieces, pistols, &c., which effect their discharge by the combustion of gunpowder or other explosive. They originated in the East, from which they passed to Europe, cannon being the first fire-arms to be generally employed. See historical and other information given in separate articles, such as ARMS AND ARMOUR, ARTILLERY, CANNON, GUN, MUSKET, RIFLE, &c.

FIRE-BALLS: (1) balls filled with powder or other combustibles, intended to be thrown among enemies, and to injure them by explosion, or to set fire to their works. (2) A popular name applied to a certain class of meteors which exhibit themselves as globular masses of light moving with great velocity, and not unfrequently passing unbroken across the sky until lost in the horizon. They differ from ordinary meteors, probably, more in volume and brilliancy than in any other distinctive characteristic. They are not to be confounded with another class of meteors, that explode in their passage and appear to let fall a dull-red body (meteorolite) to the earth.

FIRE-BRIGADES. The problem of the management of public fire-engines, and the means of extinguishing fires generally, is one that is differently solved in different towns and countries. For London there was an act passed in 1774 requiring every parish to provide itself with one large and one small engine, hose, ladders, and everything else necessary in case of fire. But this law was never well carried out in any but a few of the parishes; and as a rule these parish engines were very inefficient, partly from the nature of the engines themselves, and partly from their bad management. The first London fire-brigade was an institution entirely in-

dependent of the parishes, as indeed also of the government and of the corporation of London. It was created and exclusively supported by the insurance companies of the metropolis. At first every insurance company had its own fire-engines and its own men to work them; but in 1825 some of them joined, and when the advantages of union were seen most of the other companies desired to take part in the combination already formed, the result of which was that in 1833 a more extensive organization was formed, to which the name of the London Fire-brigade was given. By an act of Parliament passed in 1865 the Metropolitan Board of Works was intrusted with the duty of extinguishing fires within the area of their jurisdiction, and provision was made for establishing the Metropolitan Fire-brigade, a treasury grant of £10,000 annually being allotted for its upkeep, besides a small property assessment, and a payment made by the insurance companies in the metropolis. This brigade, now under the County Council, has stations and electric alarms in all parts of London with men constantly in attendance. Many of the stations are in direct communication by telephone, so that the engines may be summoned to any given spot without delay. There are several floating stations, and fire-engines placed on barges. There is not, as in many continental towns, an organized system of watchmen to look out for fires; but timely information is always obtained. Many buildings are now provided with fire-alarms which indicate of themselves the presence of fire by the ringing of a bell; and where such an alarm exists, there is usually also an instrument within reach of passers-by to communicate by telegraph with the nearest fire-station, or with headquarters. The engines in use in London are for the most part large ones drawn by horses, but there are also hand engines; and some engines again are pumped by steam, while others are pumped by the hand. (See FIRE-ENGINE.) The total annual cost of the brigade is now over £200,000, of which £10,000 is contributed by the government, and fully £30,000 by the fire insurance companies, the remainder being paid by the ratepayers. The protected area is 118 square miles. There are upwards of 270 stations of all kinds, some 70 steam fire-engines, 27 manual engines, 204 fire-escapes, &c., and the total number of officers and men is nearly 1000, not including coachmen, &c. London is not, however, entirely dependent on this brigade for extinguishing fires; for all the dock companies have engines of their own, and others are kept by private establishments. Nearly all large towns both in Britain and America have now well-equipped fire-brigades. In many places the engines are supplemented by the use of hydrants, or high-pressure fire-plugs, to which the hose may be attached directly, and which will throw a jet of water to a height corresponding to the source or reservoir from which the water is brought.

FIRE-CLAY is distinguished from ordinary clay by its refractoriness and infusibility, which render it an excellent material for bricks, crucibles, glass pots, retorts, and similar vessels which are to be exposed to a constant and very high temperature, at which ordinary bricks and clay vessels would fuse and become vitrified. This difference is due to the purity of fire-clay, or at least to the absence from it of iron, lime, magnesia, and alkalis, in appreciable quantities. It consists of hydrated silicate of aluminium almost entirely, but may contain traces of organic matter, and of some of the bases mentioned above. Very great differences in composition are, however, met with, accompanied by corresponding variations in quality, but it may be said that the silica ranges from 60 to 74 per cent, the alumina from 16 to 26 or 27 per cent,

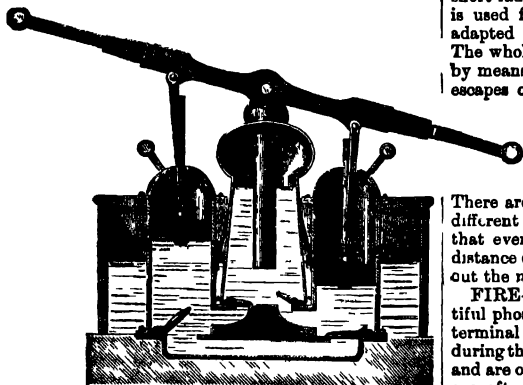
and ferrous compounds from 2 to 3 per cent. The best clays contain the largest amount of silica, but only part, and a variable part, is already combined with the bases. Some is in the condition of quartz or sand, some as hydrated acid. Probably on heating, the silica enters more completely into union with the alumina. The combined water in clay gives it its plasticity; for if it is once driven off by ignition, the clay changes its character, and cannot re-absorb water or be moulded. On the other hand, a quantity of burned clay should always be mixed with the wet clay, as it prevents the shrinking and cracking which the wet clay undergoes when dried prior to burning. When it has been burned in the kiln the fire-clay changes colour and becomes whiter than before, whereas ordinary clay becomes red, from the oxidation of the disseminated iron. But after long exposure in a furnace the colour darkens, and may become even black, a change due apparently to the formation of silicate of iron.

The most highly esteemed fire-clay is that of Stourbridge, which is used wherever high temperatures have to be resisted. Fire-clay belongs to the coal formation, and always forms a stratum immediately below the coal. It seems, indeed, to be part of the soil on which the coal vegetation flourished and died.

FIRE-DAMP. See DAMPS.

FIRE-ENGINES. The ordinary fire-engine is formed by the union of two forcing-pumps which play into a common reservoir, containing in its upper portion (called the air-chamber) air compressed by the working of the engine, as shown in the accompanying figure.

A tube dips into the water in this reservoir, and to the upper end of this tube is screwed the leather



Fire engine.

hose through which the water is discharged. The piston-rods are jointed to a double lever, the ends of which are connected with two long handles running parallel to the engine on each side, so that the lever may be worked by several men at once. The ends of the lever are thus raised and depressed alternately, and one piston is always ascending while the other is descending. Water is thus continually being forced into the common reservoir except at the instant of reversing stroke; and as the compressed air in the air-chamber performs the part of a reservoir of work (nearly analogous to the fly-wheel), the discharge of water from the nozzle of the hose is very steady. The engine is sometimes supplied with water by means of an attached cistern (as in the figure), into

which water is poured; but it is more usually furnished with a suction-pipe which renders it self-feeding. The moving power of steam has also been applied to the working of fire-engines. The plunger of the pump is connected by rods with the piston of the steam-engine, which thus takes the place of the men employed to work the lever in hand fire-engines. The most approved form of the steam fire-engine is that constructed by Shand, Mason, and Co., of London; and many of these engines are now made use of by the London and other fire-brigades. Floating fire-engines have also been constructed, and steam power has been applied to them in such a manner that it may be used either to propel the vessel or work the pumps.

FIRE-ESCAPE, the name applied to any means of escape from a burning building. Many suggestions have been made for contriving the means of effecting this, some of them being for apparatus to be used in the interior of a building, and some to be used from without. Of the contrivances to be used within a building the simplest are a rope firmly attached to something near a window, or a rope sliding over a pulley fixed to the window-sill, and the like. And of the different machines that have been made for use from without, that which is found to be the most useful is the one adopted by the Society for the Protection of Life from Fire—a society formed in London in 1836—and now generally used by the London fire-brigade. This machine was invented by Wivell, and consists of a wheel-carriage supporting a long ladder with a sort of trough underneath, made of a copper-wire net. The ladder consists of two parts, the main ladder and the upper ladder, the upper folding over the main ladder, and when required being raised to its position by ropes. There is also another short ladder carried underneath the carriage, which is used for first stories, while the main ladder is adapted to the height of ordinary second stories. The whole length of the ladder is about 45 feet, but by means of short supplementary ladders which the escapes often carry it may be increased to 60 feet.

When used the ladder is set to the window of a building which is burning; the attendant mounts it, and assists those who are in danger to descend it, or, if necessary, lets them slide down the trough.

There are numerous stations for such fire-escapes in different parts of London, and they are so situated that every house in London is within a very short distance of one. Each of them is attended throughout the night by a conductor.

FIRE-FLY, a small beetle which emits a beautiful phosphoric light from the under surface of the terminal segments of the abdomen. In America, during the summer months, these little insects abound, and are observed to be particularly active and luminous after slight showers of rain, studding the trees and grass with their pale lights. They are members of the family Lampyridæ. The phosphoric light produced by these animals is of a greenish yellow, and proceeds from a group of cells, sometimes transparent, sometimes filled with granular matter, and associated with the finely ramifying respiratory tubes. This light is under the control of the individual, though when the posterior abdominal rings containing the apparatus are separated from the body of the insect it continues to shine for some time, but, gradually becoming paler, is at length extinguished. This curious provision of nature is said to be for the purpose of directing the sexes to each other; but this explanation is unsatisfactory, since the larvæ also possess the property; but the light comes from the anterior rings. The males of some species also emit a feeble light. It is possible that enemies are de-

tered by the shining. In Europe the fire-fly is replaced by the glow-worm, a wingless female insect of this genus. The male is not luminous, and is guided to his mate by the light which she emits from a receptacle similar to that with which the American species are provided. See ELATER.

FIRELOCK, an old musket with a wheel-lock, or, more commonly, one with a flint-lock. See MUSKET. Milton says, 'If it should happen that a tyrant (God turn such a scourge from us to our enemies) should come to grasp the sceptre, here were his spear-men and his lances, here were his firelocks ready'.

FIRE ORDEAL. See ORDEAL.

FIREPLACE. See GRATE and STOVE.

FIRE-PROOFING. The subject of fire-proofing embraces the different plans that have been adopted to construct buildings and repositories for valuable articles capable of resisting the action of fire, and to render wood and textile fabrics incombustible. The method that is resorted to in making so-called fire-proof buildings consists in the avoiding, as far as possible, of all inflammable materials in their construction. The walls and partitions are of stone or brick, the doors, ties, &c., of iron, and lime or cement is used between the ceiling of one story and the floor of another in order to prevent the fire from reaching from the one to the other. In theatres there is sometimes an iron partition which may be let down between the stage and the body of the theatre, so as to confine the fire to the former if it should have broken out amongst the scenes.

A great deal of ingenuity has been applied, especially during the nineteenth century, to the construction of fire-proof safes. They are now generally constructed with double walls of stout iron, having a space of 3 to 4 inches thick between the walls, filled with some substance which is a very bad conductor of heat. Burned clay, powdered charcoal, ground alum, baked wood-ashes, sawdust, are a few of the substances most commonly used for this purpose. In order still further to diminish the conductivity of the walls of the safe small vessels filled with some liquid are frequently put in along with the substances just mentioned. The effect of this is that, when the safes are exposed to an unusual degree of heat, these vessels burst and allow the liquid contained in them to escape, which thus greatly retards the progress of the heat. Recently another device has been made use of, which consists in the employment of crystals of alum instead of the small vessels filled with liquid. As alum in its crystallized state contains nearly half its weight of water, which gradually evaporates when high temperatures are reached, and as it in so doing absorbs a considerable amount of heat, it to the same extent prevents the increase of temperature in the safe. But it ought to be mentioned that all these so-called fire-proof safes and fire-proof buildings are not really fire-proof, for they will not resist effectually any degree of heat for any length of time; and this is especially the case with the latter.

Of the various chemical substances which have been used with the view of rendering wood fire-proof the best is found to be a solution of silicate of soda. Wood carefully painted with this solution has been found not even charred after a long exposure to a fierce flame.

Among flexible fibrous substances capable of being spun and woven into tissues the asbestos possesses pre-eminently the property of slowly conducting heat; but the other fibrous matters in common use for the purposes of clothing, such as wool, cotton, &c., may, by immersion in certain saline solutions, be rendered very imperfect conductors. Sulphate of ammonia and tungstate of soda are those which are most commonly used. The former is cheap, but has

the disadvantage of becoming decomposed when the article immersed in it is ironed, and accordingly it is only recommended for use in factories, while the latter is better suited for ordinary domestic use. Borax is also very well adapted for rendering articles of dress fire-proof, but it weakens the tissue of the material, and thus renders it more liable to tear.

FIRE-RAISING, in Scotch law, is the same as arson in English law. See ARSON.

FIRE-SHIPS are generally old vessels filled with combustibles, fitted with grappling-irons, to hook enemies' ships, and set them on fire. If they are used on a river they are allowed to be carried down by the current, if they are used at sea advantage is taken of a favourable wind to bear them into the midst of the enemy and set their ships on fire, while the crews of the fire-ships make their escape in boats kept ready for the purpose. In ancient times the Tyrians employed them against Alexander, and the Carthaginians against the Romans; and during the Christian era the Crusaders made use of them at Ptolemais (Acre). In the time of Philip II. the Spaniards suffered severely by them on two well-known occasions. The first was at the siege of Antwerp in 1585, when by means of fire-ships Gianibelli utterly destroyed a bridge that the Duke of Parma was attempting to throw over the Scheldt, with the aid of some other vessels which he had prepared so as to explode when they reached the bridge. The second case was when Lord Howard of Effingham used them with such effect against the Armada in 1588. In this case also their use is said to have been suggested by Gianibelli. The Greeks in their struggle with Turkey also employed them with great success. In 1857, during the war with the Chinese, whole fleets of such vessels were sent against the British war-ships, without, however, inflicting the slightest damage.

FIRE-WORKS. See PYROTECHNY.

FIRE-WORSHIP. See GURBERS.

FIRMAMENT, in the Ptolemaic astronomy, the eighth heaven or sphere, with respect to the seven spheres of the planets which it surrounds. It is supposed to have two motions, a diurnal motion, given to it by the *primum mobile* from east to west, about the poles of the ecliptic; and another opposite motion, from west to east, which last it finishes, according to Tycho, in 25,412 years; according to Ptolemy, in 36,000; and according to Copernicus, in 25,800; in which time the fixed stars return to the same points in which they were at the beginning. This period is called the *Platonic* or *great year*.

FIRMAN.—1. Among the Turks, an order which the grand vizier issues in the name of the sultan.—2. In the East Indies, a written permission to trade. See TURKEY.

FIRST-FRUIT (English law). By the old feudal tenures one year's profit of the land, after the death of a tenant, belonged to the king. In ecclesiastical tenures this right was transferred to the pope, and subsequently in England to the crown. These ecclesiastical first-fruits were called *annates*. See ANNATES.

FISCAL, from *fiscus* (which see).—1. In most German states is an officer who has charge of the state treasury. The imperial fiscal of the old German Empire was the public prosecutor in the event of the violation of the laws or privileges of the empire, such as violations of the right of coinage, disturbances of the peace, &c.—2. In the German states, as in Scotland, the fiscal is also the public prosecutor in the criminal courts. This use of the name seems to arise from the ancient practice of punishing most violations of the criminal law by a fine. See PROSECUTOR FISCAL.

FISCHART, JOHANN, also called *Mentzer*, and in his different works by other names, was born at Mainz, between 1545 and 1550. He became Doctor of Laws, and about 1586 was bailiff of Forbach, near Saarbrück. He died in 1589. Little is known of his life, and there is much which is unintelligible in his writings; they are mostly satirical, partly in prose, partly in verse, partly of both mixed together, and have the most whimsical titles. As a satirist he is the most unrestrained of his age, inexhaustible in droll, humorous, and witty thoughts, not seldom guilty of equivocal and obscenity, intimately acquainted with the follies of his age, and never at a loss whether to ridicule or lash them. He treats the German language with the greatest freedom, coining new words and turns of expression without any regard to analogy, and displaying in his most arbitrary formations, erudition and wit. In the broad comic and burlesque he is not to be surpassed, and even in his most satirical effusions there is an honesty and good nature always observable. His most celebrated works are a *riassunto* of the *Gargantua* of Rabelais, first printed in 1575; *Das gluckhaft Schiff von Zurich* (The Lucky Ship of Zurich), 1576, 4to, and several others. We find in Fischart the first attempt at German hexameters. J. Paul Richter says he is much superior to Rabelais in regard to language, images, and meaning, and is equal to him in erudition and in an Aristophanic creation of words. He is rather the reviver of Rabelais than his translator.

FISCUS. *Fiscus* signified in the time of the early Roman emperors the private treasury of the emperor, as distinguished from the public treasury, the *erarium publicum*; as the emperors, however, monopolized all the powers of the state, the *fiscus* came gradually to take the place of the *erarium*, and the former term replaced the latter. In modern law *fiscus* denotes the public treasury, particularly when considered in a legal point of view; for instance, as entitled to all fines, or goods without an owner, or which are forfeited by the owner, &c.; or when we speak of its particular privileges. These privileges were formerly very extensive, including the right to demand interest without the corresponding obligation of paying it; the right to sue without responsibility for the expenses of the defender, &c. Modern notions of equity have tended considerably to diminish the fiscal rights of the crown in England, but except in as far as they have been voluntarily ceded, they still continue to form a part of the royal prerogative, which is determined by use rather than by positive statute. Fiscal privileges, that is, the right of having a public treasury with special prerogatives, was formerly frequently conferred on cities, universities, and other corporations.

FISH. See **ICHTHYOLOGY**.

FISHER, JOHN, Bishop of Rochester, a learned Catholic divine in the reign of Henry VIII. He was born in 1459, at Beverley, in Yorkshire, and received his education at Cambridge, which he entered in 1474. He graduated M.A. in 1491, and obtained a fellowship. In 1495 he was chosen master of Michael House, now incorporated with Trinity College, and entered into holy orders. Margaret, countess of Richmond, chose him for her confessor; and, through his influence, determined on the noble academical foundations which have perpetuated her memory. In 1501 he received the degree of D.D., and was made chancellor of the university. In 1502 he became the first Margaret professor of divinity at Cambridge. In 1504 he was promoted to the see of Rochester on the recommendation of Fox, bishop of Winchester. He subsequently declined translation to a more valuable bishopric; and he was accustomed to style his church his wife, declaring that he would

never exchange her for one that was richer. Deeply prepossessed in favour of the ancient faith of the nation, he opposed with zeal and perseverance the principles of Luther and his followers. But the same conscientious motives which induced Fisher to become the champion of Henry VIII., impelled him to oppose the king's measures for procuring a divorce from his wife, and declaring himself head of the church. In 1527 he was the only prelate who had the courage to refuse to sign a declaration that the marriage of the king was unlawful. On the Shrove Tuesday of the same year he was engaged in burning Tindall's Bibles at Paul's Cross. In 1529 he opposed the Clergy Discipline Act. His imprudence and weakness in listening to the pretended prophecies of Elizabeth Barton, or the maid of Kent, subsequently furnished the court with an opportunity of punishing his opposition to the royal designs. In 1534 an act of attainder was passed against Barton and her accomplices, among whom Bishop Fisher was included; and being adjudged guilty of misprision of treason, he was condemned to the forfeiture of his property, and imprisonment during the king's pleasure. It does not, however, appear that this sentence was executed, a fine of £300, it is said, having only been exacted. He was subsequently sent to the Tower for refusing to submit to the provisions of an act of Parliament which annulled the king's marriage with Catharine of Arragon, and confirmed his subsequent union with Anne Boleyn. He was attainted and deprived in 1534. Pope Paul III. thought proper to reward his zealous adherent by giving him a cardinal's hat (May, 1535). The king exclaimed in a passion, 'Mother of God! he shall wear it on his shoulders, for I will leave him never a head to set it on.' His destruction was immediately resolved on; and as no evidence against him existed sufficiently strong to affect his life, Henry employed crafty emissaries to entrap Fisher into a positive denial of the king's supremacy. The plot succeeded, and the bishop, being tried before a special commission, was convicted of high treason, and on the 22nd of June, 1535, was beheaded on Tower Hill. Bishop Fisher was an able theologian, a promoter and cultivator of literature, and a patron of learned men. Besides a number of tracts, he was also the author of a commentary on the Seven Penitential Psalms; of sermons, controversial and devotional treatises, &c.; his writings being partly in Latin, partly in English.

FISHERIES, a term which includes all the industries concerned in the capture of the inhabitants of fresh and salt water for food and other economic purposes. It is thus applied to the procuring not only of fish proper, but also of other animals and products found in the sea, such as sponges, corals, pearls, shell-fish, turtles, whales, seals, &c. The most important of fresh-water fisheries is that of salmon, which is prosecuted with draw-nets, stake-nets, and by sportsmen with fly-hooks. Trout, eel, pike, and perch are among the other important fresh-water fishes. Sea-fisheries, including the herring, cod, haddock, and other fishes, are prosecuted in a variety of ways. Hand-line and long-line fishing are worked more or less all round the British coasts. Of nets the chief varieties are trawls, drift-nets, seines, bag-nets, and trammel or set nets. Fisheries have generally been considered so important an object of national wealth that governments have been careful to protect and encourage them in various ways. The right to various fisheries has often been a matter of international disputes, negotiations, and treaties. Fisheries belonging to particular governments, especially inland fisheries in lakes and rivers, are also frequently protected by laws relating to the

FISHES—FIXED STARS.

mode of capture, &c., which vary with the particular circumstances. (See POACHING.) The countries whose fishing industries produce the most valuable returns are Great Britain, British North America, and the United States. The total value of the British sea-fisheries at present reaches over £8,000,000 per annum, the chief yield being from herring, haddocks, and cod. The Canadian fisheries with those of Newfoundland are probably nearly as great; those of the United States are said to be greater in value. The banks of Newfoundland are one of the richest fishing grounds in the world, and are largely frequented by French fishermen. The German Ocean also yields a very rich harvest to the fishermen of all the surrounding coasts, especially in herring, cod, haddock, flat-fish, &c. A large number of steam-trawling vessels now ply their vocation on the British coasts, and numerous steam-carrying vessels are also employed to convey the fish to shore after they have been caught by the fishing-smacks that themselves keep the sea for weeks on end.

FISHES. See ICHTHYOLOGY.

FISHING-FROG. See ANGLE.

FISIROSTRES, a group of the order Insectores or Perching Birds, formed by Cuvier, and constituting one of the four great subdivisions of the order. The Fisirostromes, which include swallows, swifts, and goat-suckers, are distinguished by the shortness of the beak and its great width of gape, and also by the shortness of the legs. They live mostly upon the wing, and prey upon insects. This group, like the other three, is not recognized in modern classifications.

FITCHBURG, a city of the United States, one of the capitals of Worcester county, Massachusetts, on a branch of the river Nashua, 25 miles north of Worcester. It has a public library, good water-works, several good schools and churches, &c., and there are manufactures of paper, machinery, woollens, cotton, bicycles, &c. The town is a railway centre. Pop. (1900), 31,531.

FITZ (old French for *fits*, son), a syllable frequently forming a prefix in English surnames (Fitz-Herbert, Fitz-Clarence, Fitz-James), like the Scottish *Mac*, and the Irish *O'*. Latterly *Fitz* always or usually denotes illegitimate descent, it may be from a king. There are several noble families of such origin, who include their royal progenitors in their genealogical tables.

FITZROY, ROBERT, admiral and meteorologist, born at Ampton Hall, Suffolk, on 5th July, 1805, was the youngest son of General Lord Charles Fitzroy, by his second wife. He entered the royal navy in 1819, and became lieutenant in 1824. He served on the Mediterranean and South American stations, and in 1828 became commander of the *Beagle*. From 1828 to 1836 he was employed in hydrographical surveys in the same vessel, and in forming a chain of meridional distances round the globe. It was under his captaincy that Darwin made his voyage as naturalist. In 1841 he was chosen member of Parliament for Durham, and in 1843 he was appointed governor of New Zealand, which post he held till 1845. He retired from active service in 1850. In 1854 he became superintendent of the meteorological department of the Board of Trade, and held this appointment till his death. In 1857 he was promoted to the rank of rear-admiral, and in 1863 to that of vice-admiral. He acquired a high reputation for his researches in meteorology, and great popularity with the public for the system of storm-warnings which he established, and which was discontinued by the Board of Trade after his death. He committed suicide while in a state of mental derangement, 30th April, 1865.

FIUME, a seaport town of Austria, or rather of Hungary, on the small river Fiumara, where it falls into the Gulf of Quarnero, in the north-east extremity of the Adriatic, 40 miles south-east of Trieste. Fiume is the seat of a governor, a commercial court, a consulate, custom-house, &c.; and possesses an old cathedral church, a municipal theatre, a gymnasium, a marine academy, a hospital, &c. Its manufactures include tobacco, paper, leather, chemicals, soap, torpedoes, and rosoglio, and it carries on ship-building. Since 1872 the Hungarian government have spent large sums in providing moles, quays, docks, and other accommodations, with the result of immensely increasing the trade. The principal exports are corn, sugar, tobacco, wood, fruit, refined petroleum, &c.; the principal imports—wine, coal, jute, rice, cotton, salt, &c. The town is connected with the interior of the country by railway. Pop. in 1890, 29,494; in 1900, 38,139.

FIXED OILS. See OILS.

FIXED STARS, those stars which appear to remain always at the same distance from each other, and in the same relative position. The name comprehends, therefore, all the heavenly bodies, with the exception of the planets, with their moons, and the comets. But besides the apparent motion of the fixed stars, resulting from the diurnal rotation of our earth upon its axis and from the precession of the equinoxes (see PRECESSION) and the aberration of light (see ABERRATION), a very slow, proper motion has been observed in them, so that it is not strictly true that the fixed stars remain in the same relative position. It has been found that Sirius, for example, has, since the time of Tycho-Brahe, moved about two minutes from its place, &c. But Herschel proved that this apparent change of place results from a real motion of our whole solar system in the celestial spaces. Stars have also been seen to appear suddenly in the heavens, and again to disappear. Of others it has been remarked that their size appears alternately to increase and to diminish. Their distance from our earth is, with a few exceptions, literally immeasurable. The most powerful telescopes cannot give them a sensible diameter. We can obtain an idea of their distance from the circumstance that, although we approach them by 81,000,000 miles (the radius of the earth's orbit), and recede from them as far, we can find no difference in them. Huyghens, by comparing the light of Sirius with that of the sun, tried to determine its distance from the earth, and, upon the supposition that Sirius is of the same size as the sun, made its distance 27,664 times greater. We are still in ignorance with regard to the nature and constitution of the fixed stars; but stellar spectroscopy leaves little doubt that they are luminous suns, around which, as around our sun, planets revolve in determined paths, receiving from them light and heat. The fixed stars are divided according to the differences in their brilliancy, which are very visible to the naked eye, into stars of the first, second, third magnitude, &c. But besides these stars which appear in the heaven as distinct bright points of light, the eye, in the clear winter nights, sees here and there little white clouds. These nebulous spots are groups of innumerable stars, which the telescope reveals to us; and the limited power of our instruments alone prevents us from looking forward without end, into the infinite regions of space. In order to distinguish more easily the fixed stars from each other, names were given to the most remarkable of them in very ancient times, and they were also divided into groups or constellations (which see). Astronomers have given descriptions of the stars, according to their situations, with their

names, magnitude, &c. Argelander's series of star charts shows the places of over 320,000 stars. See also **SIDEREAL SYSTEM, ASTRONOMY, NEBULA, SPECTRUM ANALYSIS, &c.**

FIXTURES, in law, are accessories annexed to houses or lands, which by the fact of their being so annexed become a part of the real property, and pass to the owner of it, not being removable at will by the tenant or occupier of the property. The law in regard to fixtures is not exactly alike in England and Scotland, but its tendency is the same in both countries, and in the former it has been elucidated by more frequent decisions. The principal case in which the question of fixtures is liable to arise is between landlord and tenant. The general rule of law is that whatever has been affixed to the premises or put into the land by a tenant during his occupancy cannot be removed without the landlord's consent. Large exceptions are made to this rule in favour of the tenant, covering generally fixtures for trade, for agricultural purposes, and for ornament or convenience; but the removal must not injure the land or buildings of the landlord, and in the case of farm buildings, &c., the landlord is entitled to a month's notice and to the option of purchasing the fixtures at a value determined by a reference. In questions between an heir and a personal executor the interpretation of fixtures is more favourable to the heir. In Scotland, matters of this kind are frequently determined by express stipulation in the lease.

FLACCUS, CAIUS VALERIUS, a Roman poet of the latter half of the first century, who lived in Padua (*Patavium*), and died young. He sang the expedition of the Argonauts in an epic poem (*Argonautica*), of which seven books and part of the eighth have remained to us. He followed closely the Greek work on the same subject by Apollonius Rhodius, and was an imitator of Virgil.

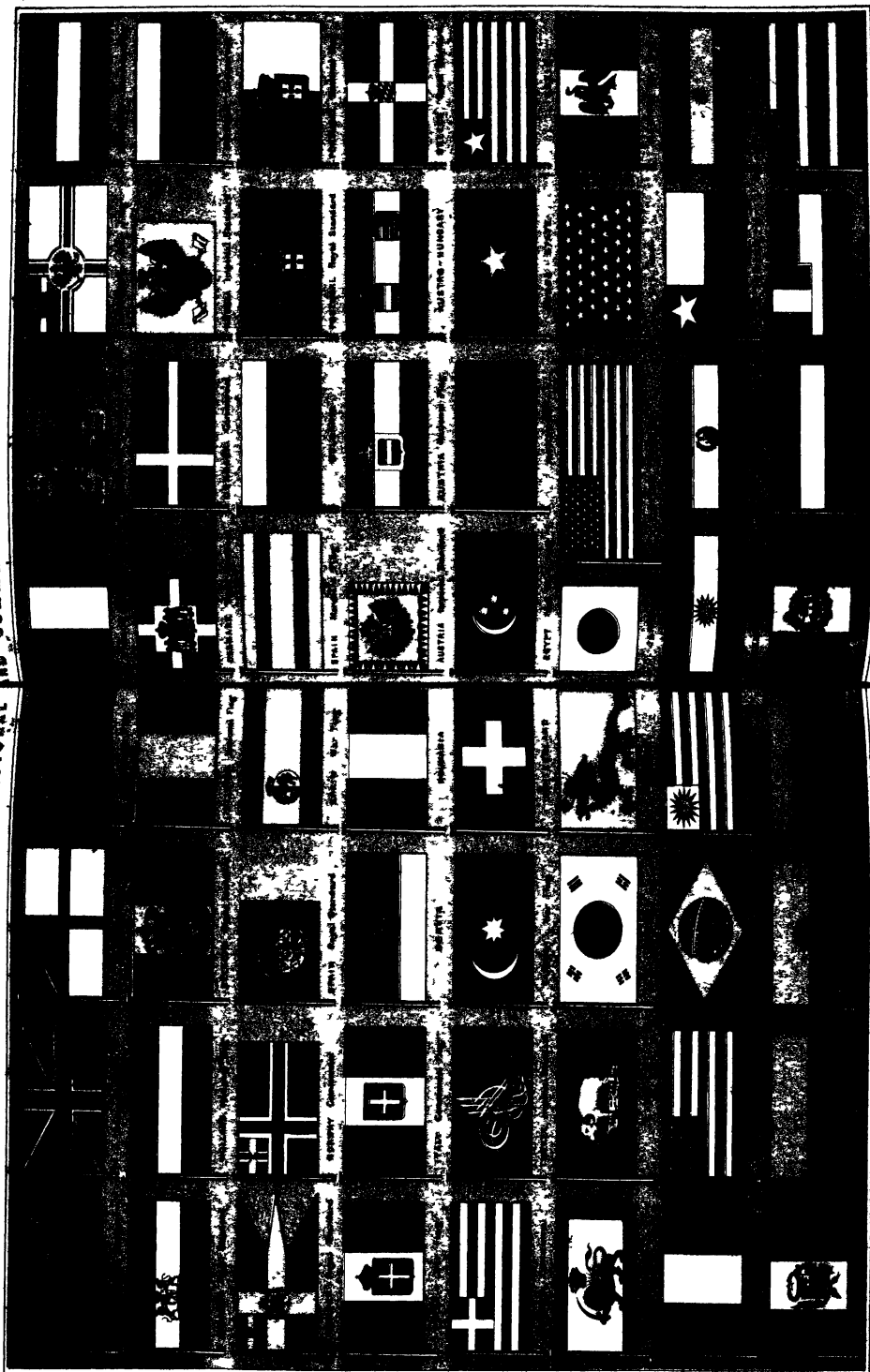
FLAG. A flag is a strip of cloth of a light fabric, varying in form and colour, and frequently bearing some emblematic design, and it is fixed by one end to a staff, pole, rope, &c., while the other is allowed to fly free. The length of a flag from the part near the staff to the free end is called the *fly*, and the measurement at right angles to this is known as the *hoist*, *height*, or *depth*. The uses of flags are numerous. They serve in a variety of ways as signals. They convey definite information of various kinds, and are used as general symbols of rejoicing, congratulation, sympathy, mourning, &c. In a classification of the uses of flags, that which stands first, as the most general, is their use as national emblems. The accompanying plate, giving a coloured representation of the various flags of the leading nations, will fully explain this use. Next in order comes the use of flags as the distinguishing emblems of the naval and military forces of particular nations. In the army each regiment is distinguished by its particular flag or colours. This usage is general, and the colours of regiments come to be distinctive of their services and of their *esprit de corps*, as well as of their position in the army. They are presented by persons of rank, frequently wrought by fair hands, and bear names and emblems commemorative of past achievements. In Catholic countries their consecration is a religious ceremony. This use of flags is of great antiquity. In the Bible we find the standards of the different tribes referred to in the arrangement of the camp of the Israelites in the desert. The Greek and Roman armies had their distinctive flags. In the French army distinctive flags were introduced during the wars in Italy in the sixteenth century. The word *drapeau* in French (which, in its most extended signification, is equal to our 'flag') is used specifically for the

colours of an infantry regiment; *standards* for those of a cavalry regiment; *pavillon* for the colours used in the naval service. Every regiment of infantry in the British army, except the Grenadier, has two colours, namely, the King's Colours and the Regimental Colour. The former, common to all regiments, of the Union device, with the name of the regiment in the centre and the number of the battalion on the upper part near the staff. The Regimental Colour is of the same colour as the collars and facings of the regiment, but if these are white, it bears a St. George's cross in red. On it are emblazoned the name of the regiment, the names of the battles in which it has served, and its various badges, crests, mottoes, &c. Among cavalry regiments, only the guards, dragoon guards, and dragoons have *standards*, as cavalry flags are termed. These are made of crimson silk, and are emblazoned like those of infantry regiments. The standards of the guards and dragoon guards are rectangular, like those of the infantry, but the dragoons carry standards with the end farthest from the staff rounded and scalloped. The lancers have red and white pennants on their lances.

The *standard* is the war flag, and bears the royal or other arms of the nation. *Ensigns* are flags carried by ships to indicate their nationality. The three ensigns used in British ships are the white, the blue, and the red. The white ensign, or ensign of St. George, which is displayed on all ships of war, has a white ground with a St. George's cross in red, and the Union device in the first canton, that is, in the upper quarter next the mast. The blue ensign, carried only by the Naval Reserve, has a blue ground with the Union in the first canton; and the red ensign, which is the distinctive flag of the mercantile marine, differs only in having a red ground. Prior to 1864 all three ensigns were used in the Royal Navy. Several yacht clubs have the privilege of flying one of the ensigns: thus, the Royal Yacht Squadron uses the white ensign. The place for the ensign in a steamer or large ship is on a pole over the taffrail; in schooners and similar ships, at the peak of the main gaff; in cutters and sloops, at the peak; in yawls, at the mizzen peak, and in rowing boats, over the stern. *Jacks* are other national flags used in signalling and various purposes. *Pennants* or *pendants* are small pointed or swallow-tailed flags generally used in connection with signals. The best known are the *answering pennant* used in the International Signal Code, and the *broad pennant* (swallow-tailed) of commodores in the Royal Navy. A *burgee* is a similar flag used by yacht clubs as a distinctive emblem, and most Royal yacht clubs have a crown as part of the device. Shipping companies usually have square flags with distinctive colours and devices; these are known as *house flags*. The *blue peter* is a blue flag with a white square in the centre, used to indicate that a vessel is about to depart. A plain white flag indicates a clean bill of health, and is used in war as the flag of truce. The quarantine flag is yellow. Vessels carrying explosives display a red flag. A flag hoisted upside down is a signal of distress, and one borne half-mast high is a sign of mourning. Flags are often dipped in token of respect. See **SIGNALS (CODE OF MARITIME), UNION FLAG.**

FLAGELLANTS (from the Latin *flagellare*, to lash or scourge), the name of a sect in the thirteenth century who thought that they could best expiate their sins by the severe discipline of the scourge. Rainer, a hermit of Perugia, is said to have been its founder, in 1260. He soon found followers in nearly all parts of Italy. Old and young, great and small, ran through the cities scourging themselves, and ex-

FLAGS. NATIONAL AND COMMERCIAL.



horting to repentance. Their number soon amounted to 10,000, who went about, led by priests bearing banners and crosses. They went in thousands from country to country, begging alms. In 1261 they broke over the Alps in crowds into Germany, showed themselves in Alsacia, Bavaria, Bohemia, and Poland, and found there many imitators. In 1296 a small band of Flagellants appeared in Strasburg, who, with covered faces, whipped themselves through the city, and at every church. The princes and higher clergy were little pleased with this new fraternity, although it was favoured by the people. The shameful public exposure of the person by the Flagellants offended good manners; their travelling in such numbers afforded opportunity for seditious commotions and irregularities of all sorts; and their extortion of alms was a severe tax upon the peaceful citizen. On this account, both in Germany and in Italy, several princes forbade these expeditions of the Flagellants. The kings of Poland and Bohemia expelled them with violence from their states, and the bishops strenuously opposed them. In spite of this the society continued so numerous, under another form, in Germany and France, in the fraternities of the *Beghards* (see *BEGUINES*), and in the beginning of the fifteenth century in Thuringia, under the name of *Brothers of the Cross* (so called from wearing on their clothes a cross on the breast and on the back), that the council assembled at Constance, between 1414 and 1418, was obliged to take decisive measures against them. The sect, however, or at least some orders bearing the same name, continued to exist in Italy, Spain, Germany, and the south of France, and some traces of it may be found even at the present day. Henry III. of France caused himself to be affiliated to an order of Flagellants called the *Blancs-battus* of Avignon.

FLAGELLATION has almost always been used for the punishment of crimes. Its application as a means of religious penance is an old oriental custom, admitted into Christianity partly because self-torture was considered salutary as mortifying the flesh, and partly because both Christ and the apostles underwent scourging. From the first century of Christianity religious persons sought to atone for their sins by voluntary bodily torture. Like the Abbot Regino, at Prum, in the tenth century, many tried to imitate the sufferings of Christ, in order to make themselves the more certain of forgiveness through him. It became general in the eleventh century, when Peter Damiani of Ravenna, abbot of the Benedictine monastery of Santa Croce d'Avellano, near Gubbio, in Italy, afterwards cardinal bishop of Ostia, zealously recommended scourging as an atonement for sin, to Christians generally, and, in particular, to the monks. His own example and the fame of his sanctity rendered his exhortations effective. Clergy and laity, men and women, began to torture themselves with rods, and thongs, and chains. They fixed certain times for the infliction of this discipline upon themselves. Princes caused themselves to be scourged naked by their father confessors. Louis IX. constantly carried with him for this purpose an ivory box, containing five small iron chains, and exhorted his father confessor to scourge him with severity. He likewise gave similar boxes to the princes and princesses of his house, and to other pious friends, as marks of his peculiar favour.

The wild expectation of being purified from sin by flagellation prevailed throughout Europe in the last half of the thirteenth century. 'About this time,' says the monk of Padua in his chronicles of the year 1260, 'when all Italy was filled with vice, the Perugians suddenly entered upon a course never before thought of; after them the Romans, and at length all Italy. The fear of Christ exerted upon

the people so strong an influence that men of noble and ignoble birth, old and young, traversed the streets of the city naked, yet without shame. Each carried a scourge in his hand, with which he drew forth blood from his tortured body, amidst sighs and tears, singing at the same time penitential psalms, and entreating the compassion of the Deity. Both by day and night, and even in the coldest winters, by hundreds and thousands, they wandered through cities and churches, streets and villages, with burning wax candles. Music was then silent, and the song of love echoed no more; nothing was heard but atoning lamentations. The most unfeeling could not refrain from tears; discordant parties were reconciled; usurers and robbers hastened to restore their unlawful gains; criminals, before unsuspected, came and confessed their crimes, &c.' But these penances soon degenerated into noisy fanaticism and a sort of trade. The penitents united into fraternities called the *Flagellants* (see preceding article), of which there were branches in Italy, France, and Germany. After the Council of Constance (1414-18) both clergy and laity by degrees became disgusted with flagellation. The Franciscan monks in France (*Cordeliers*) observed the practice longest.

It is not to be wondered at that a custom so absurd was so long maintained, when we remember the great advantages which the sufferers promised themselves. In the opinion of men in the middle ages flagellation imposed by the father confessors was equivalent to every sort of expiation for past sins. 8000 strokes and the chanting of thirty penitential psalms were sufficient to cancel the sins of a year; 30,000 strokes the sins of ten years, &c. An Italian widow, in the eleventh century, boasted that she had made expiation by voluntary scourging for 100 years, for which no less than 300,000 stripes were requisite. The opinion was prevalent likewise that, however great the guilt, hell might be escaped, and the honour of peculiar holiness acquired, by self-inflicted pain. The use of penance is still maintained by the Roman Catholic Church, but modern ideas have greatly modified the practice.

FLAGEOLET, a small wind-instrument, the notes of which are exceedingly clear and shrill. It is a sort of whistle with a mouth-piece. It is generally made of box or other hard wood, though sometimes of ivory, and has six holes for the regulation of its sounds, besides those at the bottom and mouth-piece, and that behind the neck. Its compass is two octaves, and a set of five different sizes is needed to take all the semitones in this range. It is not an instrument of orchestral rank, but is used in common bands as a substitute for the flute.

FLAG-OFFICER, in the British navy, is an officer whose rank entitles him to carry a flag at the mast-head of the ship in which he sails. This right is held by admirals, vice-admirals, and rear-admirals. See *FLAG*.

FLAG-SHIP, a ship in which an admiral, or the commander of a squadron, hoists his flag.

FLAG-STAFF, a staff or pole on which a flag is displayed, whether on shore or on board a ship. In ships a flag-staff may be set up at the stern or elsewhere, to display the colours; but the top of a mast or the continuation of it above the rigging often serves as the flag-staff. A flag-staff on land is often a kind of tall mast permanently set up.

FLAIL, an instrument for thrashing corn, that consists of—1, the *hand-staff*, which the labourer holds in his hand; 2, the *swipe*, or that part which strikes the corn; 3, the *capline*, or leathern thong, that bind the hand-staff and swipe; 4, the *middle band*, being the leathern thong that ties the capline together.

FLAMBEAU, a sort of torch made of a thick wick covered with wax or other combustible material, and of considerable size, for carrying in the hand at illuminations, night-processions, &c.

FLAMBOROUGH HEAD, a remarkable headland on the east coast of England, Yorkshire, lat. $54^{\circ}7'$ N.; lon. $0^{\circ}5'$ W. It consists of a lofty range of chalk cliffs, about 6 miles long, and rising in many places to an elevation of 300 feet perpendicular above the sea. At the base of the rocks are several extensive caverns, and on the extreme point of the promontory, at a height of 214 feet above sea level, is a lighthouse, with a revolving light, visible from a distance of 30 miles. During the summer season the cliffs here are the resort of immense numbers of sea-fowl.

FLAMBOYANT, a term applied to a style of Gothic architecture in use in France about the same period as the Perpendicular style in England. It was distinguished by the wavy and somewhat flame-like tracery of the windows, panels, &c. The church of St. Maclou, Rouen, erected 1432-1500, is said to be one of the finest specimens of this style.

FLAME. Flames consist of intensely heated gases, usually mixed with incandescent solid particles. The high temperature of the gases is maintained by chemical combination that is going on between them, chemical combination being then called *combustion*. The causes of the luminosity of flame have been examined by various experimenters. In many cases it depends chiefly on the presence of incandescent solid particles. Thus, common gas-coal, which affords a bright light in the ordinary way of burning it, may be burned, as in the Bunsen flame, in such a way as to give out scarcely any light. In the latter case oxygen is mixed with the gas in such quantities as to cause immediate combustion of the solid carbon particles along with the hydrogen. In the former, the supply of oxygen being limited, there is not a sufficient quantity to burn both the hydrogen and the carbon immediately; as the hydrogen has the greater affinity for oxygen it satisfies itself first, and in doing so it gives out much heat, which raises the carbon particles to incandescence. The flame of hydrogen, also, which is non-luminous, may be rendered luminous by passing the hydrogen through chlorochromic acid. The light of the flame in this case is plainly due to the presence of particles of sesquioxide of chromium, which the burning hydrogen renders incandescent. It is also observed, however, that at the tops of high mountains flames appear to burn with brilliancy very much reduced, and Frankland has shown that their luminosity depends on the pressure under which the gases are burning. Thus, the photometric value of a gas flame may be reduced to only 8 per cent of its original value by reducing the barometric pressure from 30 inches of mercury to 10 inches; and he has also shown that hydrogen and other non-luminous flames may be made luminous by causing the combustion to take place under increased pressure. These results have considerable importance in connection with spectroscopic observations of the flames that constitute the gaseous envelope of the sun.

FLAMEN, in Roman antiquities, a priest who was consecrated to one particular divinity; as, *flamen Dialis*, the priest of Jupiter, who was the highest of all the flamens; and *flamen Martialis*, a priest of Mars, &c. The word is derived from *flare*, to blow, and refers to the sacrificial fire. The flamens of Jupiter, Mars, and Quirinus were the *flamines majores*, and were chosen from the patricians only; the others (according to Festus twelve in number, but eventually increased to fifteen) were called *minores*. When the *minores* were deified they also had flamens, as the *flamen Augusti*.

FLAMINGO (*Phenicopterus*, Linn.), a genus of web-footed birds which may be regarded as in some respects intermediate between the storks and the ducks, their long legs and necks giving them a resemblance to the former, while their webbed feet connect them with the latter. There are nine species of true flamingoes, widely spread over the warmer regions of both hemispheres, the European species being known to naturalists as *Phenicopterus roseus* (or *antiquorum*). The body of the European flamingo is smaller than that of the stork; but, owing to the great length of the neck and legs, it stands 5 or 6 feet high. The head is rather small compared with the bill, which is nearly 7 inches long, higher than it is wide, light and hollow, and suddenly curved downwards from the middle. 'The lower mandible forms a deep and broad box, into which the upper one, which is much lower and narrower, fits like a lid.' The long legs and thighs of this bird are extremely slender, as is also the neck. The plumage of the bird is not less remarkable than its figure, being of a beautiful rosy colour generally, with the exception of the quills of the wings, which are black, and the wing-coverts, which are light scarlet. The young differ greatly from the adult, changing their plumage repeatedly. The flamingoes live and migrate in large flocks, frequenting desert sea-coasts and salt-marshes. They are extremely shy and watchful. While feeding, they keep together, drawn up artificially in lines, which at a distance resemble those of an army; and, like many other gregarious birds, they employ some to act as sentinels, for the security of the rest. On the approach of danger these give warning by a loud sound, like that of a trumpet, which may be heard to a great distance, and is the signal for the flock to take wing. When flying, they form a triangle. Their food appears to be mollusca, spawn, grass, water-plants, insects, &c., which they fish up by means of their long neck, turning their head in such a manner as to take advantage of the bend in their beak: while slippery prey is secured by the denticles on the hind part of the very large tongue. They breed in companies in mud-flats or inundated marshes, raising up the mud into a small hillock, which is concave at the top so as to form a nest. In this hollow the female lays her eggs, and hatches them by sitting on them with her legs doubled up under her, not hanging down on each side like the legs of a man on horseback, as was long ago described by Dampier, and repeated by all the textbooks until recently disproved by competent observers. The nests, indeed, are not so high as to admit of this posture. It is said that when the birds cannot, from circumstances, form nests of this kind, they drop their eggs almost anywhere. The young, which never exceed three in number, do not fly until they have nearly attained their full growth, though they can run very swiftly and swim with ease almost immediately after their exclusion from the shell. This bird was held in high repute among the luxurious Romans; and Apicius, so famous in the annals of gastronomy, is recorded by Pliny to have discovered the exquisite relish of the flamingo's tongue, and a superior mode of dressing it. Travelers have expressed different opinions respecting the flesh of this bird. Some consider that of the young equal to the partridge, others say that it is very indifferent. In some parts these birds are tamed, principally for the sake of their very fine down. When taken young they soon grow familiar, but they are not generally found to thrive in the domesticated state. The flamingo is abundant in various marshy regions of Spain and Southern France, and is spread over a wide area, being found as far south

as Cape Colony, and as far east as Lake Baikal. In north-western India it may be seen in flocks numbering tens of thousands. The common American species, *P. ruber*, is of a deep-red colour, with black quills. It is peculiar to tropical America, migrating in summer to the southern, and rarely to the middle states. A smaller species, *P. parvus*, is found in South Africa. See illustration at ORNITHOLOGY.

FLAMSTEED, JOHN, the first astronomer-royal of England, was born at Denby, near Derby, on 19th August, 1646. He began his mathematical and astronomical studies at an early age, and also showed a talent for constructing instruments. About 1687 he wrote a tract showing the true causes of the equation of time. About 1670 he visited London and Cambridge, where he had interviews with Newton and Barrow, and entered himself of Jesus College. In 1674 he took the degree of M.A., and in 1675 he took orders in the church. He still continued his astronomical observations, and was in constant correspondence with scientific men. He found the astronomical tables of the day to contain large errors, and was anxious to make more detailed and accurate observations. This having come to the knowledge of Charles II., he was appointed astronomical observer to the king, and carried on his observations at the Queen's House at Greenwich, until the observatory was built for him in 1676. Here he passed the remainder of his life amidst his astronomical labours, which are considered as the foundation of modern practical astronomy. He was so ill supported that he had to teach for his own support, and erect instruments at his own expense. In 1684 he was presented with a small living, and his father dying in the same year, he was enabled to provide some needful apparatus at his own expense, which, on his death, was claimed by the government as public property. He died 31st December, 1719. Particulars of his life are contained in Bailly's Account of the Rev. John Flamsteed (1835), based on Flamsteed's correspondence, autobiographical writings, &c., partly discovered in 1832. These disclose a protracted quarrel between him and Newton. Flamsteed had for a considerable time supplied Newton with observations of the moon's places for his lunar theory. Their correspondence was broken off about the time of Newton's appointment to the mint, the latter appearing not to consider the information he received as satisfactory. In 1698 Newton again applied to Flamsteed, who supplied him with corrections of former observations. Newton was afterwards appointed by Prince George of Denmark one of a committee intrusted with the publication of Flamsteed's observations. This committee, after the astronomer had given up his manuscripts to them, appear to have treated him with little courtesy or regard. They broke the seal of a manuscript containing a part of his catalogue of stars without his consent. Newton's answer when charged with this by Flamsteed was that it was done by the queen's command. On the death of Prince George Flamsteed had to commence a lawsuit against Newton to recover some of his manuscripts. Such is an outline of the story as told by Flamsteed.

FLANDERS (French, *Flandre*; German and Flemish, *Flandern*; Dutch, *Vlaanderen*), a former country or district of Europe, now included in Holland, Belgium, and France. It stretched from the Schelde, below Fort Lillo, west along the Hond, or West Schelde, and west-south-west along the German Ocean to the entrance of the Straits of Dover, near Gravelines, and was bounded *n.* by the duchy of Brabant, *s.* by Hainaut, and *w.* by the French provinces of Artois and Picardy. The origin of the name is unknown. It occurs for the first time, but

in a very restricted sense, in the seventh century. The erection of the territory into a county took place in the ninth century, and was made by Philip the Bold, king of France, in favour of his son-in-law, Baldwin, of the Iron Arm. It afterwards passed to the united houses of Spain and Austria, and ultimately to the latter, but underwent considerable curtailment by the conquests of the French in the west, when part of it became French Flanders, and is now included in departments Nord and Ardennes; and by the conquests of the Dutch in the north, who succeeded in including the most northerly portion of it in the province of Zeeland. The remainder still retains its ancient name, and forms the modern provinces of East and West Flanders, in Belgium.

FLANDERS, EAST (French, *Flandre Orientale*), a province of Belgium, bounded *n.* by Holland, *s.* by the provinces of Antwerp and Brabant, *s.* by Hainaut, and *w.* by West Flanders; length, north to south, 84 miles; central breadth, east to west, 82 miles; area, 1167 square miles. The surface forms an extensive plain, sloping gently eastwards. It wholly belongs to the basin of the Schelde, which by itself, its tributaries, and canals connected with them, furnishes ample water communication. Its soil, partly of a sandy and partly of a clayey nature, is so industriously and skilfully cultivated that it has the appearance of a vast garden, and presents one of the richest rural landscapes which anywhere exists. The Pays de Waes, included almost wholly in the arrondissement of Termonde, is regarded as one of the most fertile and populous spots in Europe. The principal crops are wheat and flax, but almost all the plants which can be grown under the same latitude are cultivated with success. The domestic animals, particularly horses and cattle, are of excellent breeds. Dairy husbandry is particularly attended to. Sheep are not numerous. There are no forests properly so called, but owing to the general practice of planting hedge-row trees, there is no want of wood. In general, however, it consists of poplar and other soft-wood trees, and makes only indifferent timber. There are no minerals of any value, but manufactures have made great progress, and all the ordinary, as well as the fine tissues of wool, cotton, and flax, are well and largely made. There are also numerous tanneries, breweries, distilleries, soap-works, roperies, sugar and salt refineries, &c. The trade includes, in addition to these articles, flax, hops, and oil. For administrative purposes the province is divided into six arrondissements—Gand, or Ghent, the capital; Alost, Audenarde, Termonde, St. Nicolas, and Eecloo. Pop. in 1900, 1,039,138.

FLANDERS, WEST (French, *Flandre Occidentale*), a province of Belgium, bounded *n.* and *n.w.* by the German Ocean, *s.w.* and *s.* by France, *n.e.* by the province of Hainaut, *s.* by East Flanders, and *n.e.* by Holland; greatest length, north-north-east to south-south-west, 54 miles; greatest breadth, 48 miles; area, 1248 square miles. The surface is generally flat, but a few low hills occur in the south and east, and a range of sand hills or downs lines the greater part of the coast. The south-eastern portion of the province belongs to the basin of the Schelde, which, forming the boundary between it and Hainaut, receives part of the drainage directly, and the remainder by the Lys; but the far larger part of the province sends its waters directly to the German Ocean by a number of small streams, of which the Yperle is the only one deserving of notice. The others are chiefly employed in feeding canals. Much of the soil is naturally sandy and poor, but the untiring industry of the inhabitants has converted the far greater part of it into fertile plains. Large tracts of moor, however, still exist and cannot well be dis-

pensed with, as they form the principal source of fuel. The most important crops are flax, both abundant in quantity and excellent in quality; oats, barley, hops, oil-seeds, tobacco, madder, and chicory. The cattle, of all sorts, are of excellent breeds; and fish, poultry, and game abound. The most important branch of industry is linen, ordinary and damask. Great quantities of lace also are made, and there are numerous breweries, distilleries, tanneries, dye-works, oil-works, soap-works, salt and sugar refineries, &c. The province is divided into eight arrondissements—Bruges (the capital), Courtrai, Ypres, Furnes, Thielt, Roulers, Ostend, and Dixmude. Pop. in 1897, 792,297.

FLANK (French, *flanc*), in fortification, that part of a work which affords a lateral defence to another. In a bastion the flanks are those lines which join the central wall. In tactics, flank signifies the outer extremity of the wing of an army; and it is one of the most common manoeuvres to turn this point. The enemy is then obliged to withdraw his flank, therefore to change his front, and is thus exposed to a defeat. This manoeuvre is called flanking. A bold, but not always practicable manoeuvre, to prevent the consequences of this attempt, is that of turning the opposite flank of the enemy who makes it. This is called outflanking. To attempt to turn both flanks of an enemy, unless with a very strong force, is generally condemned as bad tactics. The word flank is used in military affairs in many other ways, which are easily understood from the instance given, as the *flank files* or *companies* of a body of troops.

FLANNEL, a woollen fabric of more or less loose texture and various degrees of fineness, much used as an article of clothing both in hot and cold countries, and for outer as well as inner garments, being very commonly worn next the skin. It has the valuable property of promoting insensible perspiration, the moisture being carried off by the atmosphere. Flannel made in Wales from the wool of the native mountain sheep has the highest reputation.

FLAT, a character or sign in music, used for lowering the pitch of a note or succession of notes by a semitone. The double flat sign indicates that the note beside it is to be lowered two semitones. The sign for a flat is an altered form of an old letter B. A singer or an instrument is said to be flat when the sounds produced are below the correct pitch. See **MUSIC**.

FLAT-FISH, the popular name of the family Pleuronectidae, including the sole, plaice, turbot, halibut, brill, and others. See **PLEURONECTIDÆ**.

FLATHEAD INDIANS, a name applied to various tribes of American Indians, who are addicted to the curious practice of flattening the head. The flattening takes place as a result of pressure applied in infancy, and seems not to injure the intellect in any way. The pressure is sometimes applied from before backwards, at other times from above downwards.

FLAVINE, a yellow or orange dye-stuff. American flavine is got from quercitron bark, and is said to be the same as quercitrin. English flavine is a lake precipitated from a solution of the bark. Flavine is employed for dyeing yellow and orange, especially on wool or silk. See **DYEING**.

FLAX (*Linum usitatissimum*), a plant of the natural order Linaceæ, has been cultivated from remote antiquity throughout a great part of Europe, Asia, and the north of Africa, for various purposes. Its native country is not known with certainty. The flax is annual; the stem slender and frequently simple, from 18 inches to 2 feet high; the leaves

alternate, entire, and lanceolate or linear; the flowers blue and pedunculate, consisting of five petals, and succeeded by capsules of ten cells, each cell containing one seed. Other species are cultivated as showy annuals in gardens. Common flax is cultivated principally for the fibres yielded by it, of which linen is made. The use of this article is so ancient that no tradition remains of its introduction. The mummies of Egypt are always enveloped with it; and its use among the ancient Jews is familiar from the Bible. The use of linen passed from Egypt to Greece and Italy. Besides forming agreeable and beautiful apparel, the rags are made into paper. As a British crop flax was formerly of far more importance than it now is, little of it being now grown in either England or Scotland. In Ireland it still holds an important position; but most of the flax used in the linen manufacture of Britain comes from Russia.

The seeds of the flax are mucilaginous and emollient, and an infusion of them is often used as a drink in various inflammatory disorders; they also yield an oil well known in commerce under the name of *linseed-oil*, which differs in some respects from most expressed oils, as in congealing in water, and not forming a solid soap with fixed alkaline salts. This oil has no remarkable taste, is used for lamps, sometimes in cookery, and also forms the base of oily varnishes. It is much employed in the coarser kinds of painting, especially in situations not much exposed to the weather. Equal parts of lime-water and linseed-oil form one of the best applications for burns. The cakes of seed remaining after the oil is expressed are used for fattening cattle and sheep. Flax-seed has been substituted for grain in times of scarcity, but it is heavy and unwholesome.

In Egypt, flax is sown about the middle of December, and is ripe in March. In Europe and in America it is generally sown in the spring, from March to May, sometimes, however, in September and October. In a dry and warm country it is better to sow in autumn, as autumn and winter favour its growth, and it acquires strength enough to resist the drought, should there happen to be any in the spring. On the other hand, in cold and moist countries, sowing should be deferred till late in the spring, as too much moisture is hurtful. A light soil is the most suitable, though good crops are raised both on mossy and clayey grounds. As it appears to degenerate when repeatedly sown without changing the seed, it is usual, in some countries, to import the seed from the north of Europe, particularly from Riga, which affords the best. The American seed also bears a high reputation, and in Ireland is preferred for the lighter soils, and the Baltic for the more clayey. In general, however, in order to prevent its degenerating, it is sufficient to change the soil frequently by sowing in the heavier lands the seeds ripened in the lighter, and the reverse.

There are three varieties of flax: the first produces a tall and slender stem, with very few flowers, ripens late, and affords the longest and finest fibres; the second produces numerous flowers, and is the most proper for cultivation where the seed is the object, but its fibres are short and coarse; the third is the most common, and is intermediate between the other two. It is important not to mix the seeds of these three varieties, as they ripen at different periods, and besides, the first should be sown more closely, and the second at greater intervals than the third. When it is a few inches high it should be freed from weeds, particularly from dodder (if it occurs), a parasitical plant, consisting of yellowish or reddish filaments, and small white flowers: all the stems which have this plant attached to them should be pulled up

and burned. To prevent its lying on the ground it is usual with some to stretch lines across the field, intersecting each other, and fastened at the intersections. As soon as it begins to turn yellow, and the leaves are falling, it is pulled, tied together in little bundles, and usually left upright on the field till it becomes dry, when the seeds are separated, either by beating on a cloth, or by passing the stems through an iron comb. The process of removing the seeds is called *rippling*. The stems, after being placed even at the base, are again tied together in bundles for *retting*, as it is called—a process which is necessary to facilitate the separation of the fibres, and which is accomplished in three different manners: 1st, on the surface of the ground (*dew-retting*), which requires a month or six weeks; 2d, in stagnant water (*water-retting*), which is the most expeditious manner, as only ten days are necessary; but the fibres are of inferior quality; 3d, in running water, for which about a month is necessary. The finest fibres are produced by this latter mode, and certain rivers are considered as possessing advantages over others. Whatever method be made use of, it is necessary to turn it every three or four days. After this process it is taken out, dried, and is ready for having the fibres separated from the woody part of the stem.

In order that this may be accomplished the flax has to pass through one or two operations. The first of these is called *breaking*, which is very frequently performed by hand, but also by machinery. The apparatus for hand-breaking consists essentially of two parts, a horizontal wooden framework resting upon feet, and having spars, with openings between them extending longitudinally from end to end of it; above this rests a corresponding movable framework, hinged at one end to the fixed framework, and having spars fitting into the intervals between those of the latter. In working the apparatus the operator lifts the upper frame with his left hand, and with his right places a parcel of the flax-stalks between the two frames, shifting it gradually across the lower, and giving it successive blows with the upper. The woody matter is thus perfectly broken and fitted for separation by the process of *scutching*. The process of breaking the flax is, however, more perfectly and easily performed by machinery. The essential parts of a machine for the purpose consist of three deeply-grooved rollers connected together, the one above the other. The dry flax-stalks are introduced between the upper and middle one; they are guided round the back of the middle roller, and come out again over an inclined table between the middle and lower roller. The flutings or longitudinal groovings break the woody part of the stalk more perfectly and uniformly than any manual skill can do it. After being thus broken the flax is ready for *scutching* or *winnowing*, and here again the hand process has been successfully imitated by machinery. In the manual process a flat, thin blade of wood, attached to a handle, and presenting a sharp edge, is used; the flax is laid in successive handfuls over an upright stand, presenting nearly a horizontal edge, on which the flax is rested, and successive blows are given with the edge of this blade upon the projecting part of the handful, which is turned about so that every part of it may be presented in turn. In the scutching-machine a number of such blades are carried round at the ends of the radii of revolving wheels, and as they pass by edges over which the flax may be laid, the process is precisely similar in method and result to that already described. The flax is next *hecked*, or combed with a sort of iron comb, beginning with the coarser and ending with the finer, and is now ready for spinning. See LINEN.

FLAX, NEW ZEALAND (*Phormium tenax*). The

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fibre obtained from this plant (which is also called New Zealand hemp) has long been used by the aborigines of New Zealand for the making of cord and for weaving into cloth, and it is now employed similarly in European and other countries. It is a tall and handsome plant, belonging to the natural order Liliaceae, with a fleshy tuberous root and numerous leaves, which are radical, ensiform, from 3 to 6 feet in length, of a brilliant green above, whitish beneath. The flowers are yellow, and borne in numbers on a branched stalk. It was discovered by Sir Joseph Banks during Cook's first voyage, and abounds in various parts of New Zealand, being also found in Australia. The preparation of the fibre by the Maoris consists generally in tearing the leaves into strips, scraping them, beating and soaking them in water, till the fibres are separated from the cellular tissue. Special machinery has been introduced for preparing the fibre on a commercial scale, and more especially for its use in making ropes and twine. It has also been used for making textile fabrics, alone or mixed with flax, and also for paper. The strength and tenacity, along with the beautiful silky gloss of the fibres, occasioned its introduction into Europe, where, especially in Southern France, it is grown with considerable success. It has also been introduced into Algeria, the Azores, and elsewhere, and it seems to thrive best near the sea. It is now well known in greenhouses and gardens. Taking the mean strength of hemp at 16½, the relative strength of the New Zealand flax is 23½, that of common flax 11½, and that of silk 34. Considerable quantities of this article are exported from New Zealand.

FLAXMAN, JOHN, an eminent English sculptor, was born at York in 1755. His earliest notions of art were derived from casts in the shop of his father, who sold plaster figures, from many of which he made models in clay. In 1770 he was admitted a student of the Royal Academy, where he prosecuted his studies with great diligence. In 1787 he went to Italy, where he remained seven years, and left many memorials of his genius, which have been much admired. While in Rome he executed those fine illustrations of Homer, Dante, and Æschylus, which at once made him known in Europe. The illustrations of Homer and Æschylus were published at Rome in 1793; and the former were republished, with additions, in London, 1805. Those of Dante were also published in London in 1806. When he commenced his designs from the Greek poets he confined himself almost entirely to copies of subjects on the Greek vases. In 1794 he returned to England, where he was diligently occupied with his professional pursuits until his death in 1826. He had been elected an associate of the Royal Academy in 1797, royal academicien 1800, and in 1810 was appointed professor of sculpture to that institution. His lectures have been published since his death (8vo, London, 1829, fifty-two plates). His monuments of Lord Mansfield in Westminster Abbey is considered one of the finest public monuments in England. His monuments to Collins at Chichester, to Earl Howe in St. Paul's, and to Sir Joshua Reynolds, are among his best works in sculpture, which are, however, accused of being somewhat deficient in softness, finish, and grace. He also executed statues of Washington, Sir W. Jones, Pitt, Lord Nelson, &c., and some colossal groups. His illustrations of Homer, Æschylus, and Dante, were republished in Germany and in Paris.

FLEA, the name of any insect of the small order Aphaniptera, sometimes regarded as a sub-order of Diptera, and so called because the wings are inconspicuous, being reduced to scales which are applied to the sides of the thoracic rings. The small head

and large abdomen of the common species (*Pulex irritans*), which forms the type of the family Pulicidae, co-extensive with the order, give a look of disproportion to an insect which nevertheless is of very great activity. The last pair of limbs are greatly elongated, and serve for springing. The proboscis consists of the serrated mandibles and the penetrating organ, which are inclosed in a half-tube formed by the underlip. The tolerably numerous species of this genus live as gregarious parasites on mammalia and birds, feeding on their blood. The common Flea (*P. irritans*—see Plate III. at ENTOMOLOGY) is diffused over the whole earth, but abounds most in warm and dry climates, where it forms a great pest. It lays about twenty eggs, in the chinks of the floor or furniture of rooms, or among the hairs of domestic animals. In six to twelve days the eggs produce little footless maggots, which in eight days are changed to pupæ. Nothing but great cleanliness, and, above all, careful washing and scrubbing of floors, can banish the flea entirely, or greatly limit its numbers. The sand-flea (*Sarcophylla penetrans*), called also *chigoe*, is much smaller, and is found chiefly in the West Indies and tropical America, on dusty hot spots in the vicinity of houses. The female inserts herself under the skin of the toes, the soles or balls of the feet in man, and also in house-dogs, and sometimes grows to the size of a nut when her abdomen is distended with eggs. The swelling produces very painful sensations, and if neglected usually terminates in serious ulcers. The dog-flea (*Ceratophyllus canis*) is nearly black, and has large eyes. It is found on dogs, cats, &c. *C. gallinae* is found on poultry and other birds.

FLECHE, LA, a town of France, in the department of Sarthe, in a beautiful valley on the right bank of the Loir, 25 miles south-west of Le Mans. It consists of wide and handsome streets, was formerly defended by a castle situated on an island in the river, now in ruins, but once celebrated for its strength; and has a military college, occupying part of the extensive buildings of a former college belonging to the Jesuits, and now devoted to the education of sons of officers without fortune; a fine old Byzantine church, the *fleche* or spire of which gives name to the town; a town-house, court-house, and hospital. There are manufactures of gloves, beer, &c. At the harbour in the Loir, near which there is a fine walk bordered with elms, some trade is carried on in grain, fruit, and cattle. Pop. (1896), 7558.

FLECKNOE, RICHARD, poet and dramatic writer, contemporary with Dryden, is supposed to have been an Irish Roman Catholic priest. He travelled extensively in Europe and South America between 1640 and 1650. He is chiefly memorable for having had his name gibbeted by Dryden in the title ('Mac-Flecknoe') of his invective against Shadwell. He probably died in 1678. Some of his poetical works have occasional happy phrases, but they are mostly poor. Among his publications are *Hierothalamium* (1626); *Love's Kingdom* (1661), a play; *Epigrams of All Sorts* (1671); and some prose works.

FLEECE, GOLDEN. See ARGONAUTS and JASON.

FLEECE, ORDER OF THE GOLDEN, one of the oldest and most honourable orders of knighthood in Europe, was established by Philip III. of Burgundy, surnamed the Good, January 10, 1429, at Bruges, on the occasion of his marriage with his third wife, Isabella, daughter of King John I. of Portugal. In the beginning of the statutes of the order Philip says he took the name from the golden fleece of the Argonauts, Jason, and that the protection of the Christian was the object of the order. He declared himself grand-master, and ordered that this dignity should be hereditary in his successors in the govern-

ment. The chief decoration of the order is a chain composed of flints and steels alternately, with the golden fleece attached—a sheep's skin suspended by the middle, and the head and legs hanging down. Annual chapters were to be held, when the majority was to decide on the admission of new members. But several of the first statutes were changed. Philip himself increased the number of knights from twenty-four to thirty-one; Charles V., his grandson, to fifty-one. The last chapter was held in 1559 at Ghent. Since that time the monarch has made knights of the Golden Fleece according to his pleasure. When, after the death of Charles V., the Burgundian possessions and the Netherlands fell to the Burgundian-Spanish line of the house of Austria, the kings of Spain exercised the office of grand-master of the order; but when the Emperor Charles VI. received, after the war of the Spanish Succession, the Spanish, afterwards the Austrian, Netherlands, he insisted upon being held as the grand-master of the order. The dispute was not settled, and the order at present is conferred both at Vienna and Madrid. The chain is now the decoration only of the grand-master; the other knights wear a golden fleece on a red ribbon. The Spanish golden fleece differs from the Austrian by the inscription *Pretium laborum, non vitæ*, upon the steel.

FLEET, a general name given to the royal navy; also to a considerable number of ships, whether designed for war or commerce, keeping in company. A fleet is commanded by an admiral or vice-admiral, whilst a squadron is a portion of a fleet under the command of a commodore or similar officer.

FLEET MARRIAGES, in London, a kind of irregular marriages formerly performed without license by needy clergymen, who were ready to marry any couples that came before them for a fee proportioned in amount to the circumstances of those who were married. They were called Fleet marriages because they were usually performed by clergymen who, for debt or some other reason, were compelled to live within the Fleet Prison (see next article), and who, having neither money nor character to lose, paid little regard to the penalties imposed by the legislature for the performance of such marriages, and were quite beyond the reach of any punishment that might be inflicted by the Church. Before 1616 marriages of this nature were performed by the incumbents of Trinity Minorities and St. James', Duke's Place, who believed themselves to be beyond the jurisdiction of the Bishop of London; but one of the incumbents of St. James' having been in that year suspended from his office for this offence, the incumbents of these churches no longer ventured to continue the practice. From this date till 1754 Fleet marriages were frequent, and the most extraordinary couples were often conjoined in matrimony without the slightest scruple on the part of either performers or witnesses. People of all classes, in some cases even belonging to the ranks of the nobility, came to solicit their services; and when there was any lack of voluntary custom it would seem that the priests of the Fleet did not hesitate to use means to entrap people into being married against their will, and even to use threats and violence in order to compel them to submission. Miss Hawkins, in her *Anecdotes*, records a case which will illustrate the extraordinary nature of some of the Fleet marriages. This was the case of Lady Lucy Pitt, daughter of the Earl of Londonderry, who at the age of fourteen was married to a boy belonging to Westminster School; her cousin, who was a little older than herself, at the same time marrying his brother. It seems that on this occasion the clergyman who united the couples exhibited unusual scrupulousity, as he objected to marry Lady Lucy on account of her

extreme youth. His scruples, however, were not very strong, as they were overcome by Lady Lucy playfully remarking that her cousin might be married first, and then lend her her gown, which would give her a more womanly appearance. Miss Hawkins also relates that the two brides were so undecided in their minds that they had not finally fixed their choice of husbands, and that they actually exchanged bridegrooms immediately before the performance of the ceremony. Fleet marriages were finally put a stop to by a bill brought into Parliament in 1753, rendering such marriages illegal and invalid. The bill met with violent opposition, especially on the part of Henry Fox, first Lord Holland, who had himself been married somewhat after this irregular fashion; but it ultimately became law, and from March 25, 1754, such marriages were no longer recognized.

FLEET PRISON, a once-celebrated prison in London, pulled down in 1845. It stood on the east side of Farringdon Street, and on this site a prison was in existence as early as the twelfth century, which took its name of Fleet Prison from the Fleet River (or Fleet Ditch), a brook that used to flow close by, and which is now arched over. The prison was early used as a place of confinement for debtors, and served as such down to the period of its abolition. It was at one time notorious for the irregular marriages contracted within its walls, hence called Fleet marriages. (See above article.) The building demolished in 1845 had been erected about the end of the eighteenth century, after the burning of the old one in the Gordon Riots in 1780.

FLEETWOOD (FLEETWOOD-ON-WYRE), a seaport and watering-place in England, in the county of Lancaster, on the Wyre, near its entrance into Morecambe Bay, 18 miles north-west of Preston. This place has sprung up since the year 1836, and is now a considerable town, containing a number of regular streets, and having a large trade. It has a handsome church, a market-house, a free library, lighthouse, custom-house, large grain warehouses, barracks, electric tramways, &c. The harbour is safe and commodious. Royal mail steamers ply daily between this port and Belfast, and in summer run to the Isle of Man. In 1899 the number of vessels entered was 2320, of 476,666 tons. There is a dock, with a water area of 10 acres. Pop. in 1891, 9274; in 1901, 12,093.

FLEMING, JOHN, D.D., a Scottish naturalist, born at Kirkcubright, near Linlithgow, in 1785; died at Edinburgh, Nov. 18, 1857. He entered the Scottish church, and in 1808 was ordained to the pastoral charge of the parish of Bressay, in Shetland, having already founded his fame as a naturalist by publishing a Report on the Economical Mineralogy of the Orkney and Zetland Islands (1807). In 1822 he published at Edinburgh the first of his important works, entitled the Philosophy of Zoology. This was followed in 1828 by his British Animals, a work whose merits were acknowledged by the most eminent naturalists, and to which subsequent productions of a similar description have all been more or less indebted. In 1832 he became minister of Clackmannan, and in 1834 was appointed professor of natural philosophy at King's College, Aberdeen. At the Disruption of 1843 he joined the Free Church, and in 1845 accepted the professorship of natural science in the New College, Edinburgh, established by the new church. This post he held till his death. Besides the works already mentioned, Dr. Fleming was the author of the article on Mollusca, contributed in 1837 to the Encyclopedia Britannica; the Temperature of the Seasons (1851); the Lithology of Edinburgh (1859); and a large number of articles on zoology, paleontology, and geology contributed

to the Encyclopedia Britannica, the Edinburgh Encyclopedia, the North British Review, &c. Throughout his whole scientific career the chief aim of Dr. Fleming was to be the strict interpreter of nature, and he carefully avoided every appearance of hypothesis. The estimation in which he was held by contemporary naturalists is shown by the declaration of Professor Agassiz, that 'he should have been abundantly recompensed for his visit to England had he gained no more by it than what he saw and learned during his few hours' visit to Dr. Fleming'.

FLEMING, PAUL, one of the best German poets of the seventeenth century, was born October 17, 1609, at Hartenstein, in the Saxon Erzgebirge. His father was a schoolmaster; and after receiving a good education at home, he went to the royal school at Meissen, and from thence to Leipzig, where he studied medicine and other subjects. The confusion of the Thirty Years' War led him, in 1633, to Holstein, where the Duke Frederick was on the point of sending an embassy to Russia and Persia. Fleming, full of ardour and enthusiasm, sought a place in the ambassador's suite, obtained it, performed the journey with him, and returned safe. This expedition lasted nearly four years, from 1635 to 1639. After returning, his ambition was to settle as a practising physician in Hamburg, and he went in 1640 to Leyden, where he took his doctor's degree. He had but just returned to Hamburg, when he was snatched away by death, April 2, 1640. In his songs and sonnets, sacred and other poems, an amiable enthusiasm is joined to deep and warm sensibility. His longer poems describe the adventures of his journey with great spirit and power, and other accidental events with originality and liveliness, and all his works bear the impress of genius. The first edition of his poems (*Teutsche Poemata*) appeared at Lubeck in 1642. A selection from his poems is contained in more than one recent publication, and several works treating of his life and writings have been published.

FLEMISH LANGUAGE AND LITERATURE.
See NETHERLANDS.

FLENSBURG (Danish *Flensborg*), a town in Prussia, in the province of Schleswig-Holstein, at the west end of the fiord of same name, 20 miles N.W. of the town of Schleswig. It was a place of importance as early as the twelfth century, but subsequently suffered much from wars and conflagrations. It is again prosperous, and is now the most important town in Schleswig. The industrial establishments include ship-building yards, sugar-refineries, tobacco-factories, soap-works, foundries, breweries, distilleries, a rice-mill, a palm-oil factory, &c.; and the trade, partly with the West Indies, is considerable. In 1848 Flensburg was seized by the Holsteiners, and its environs became the scene of hostile operations. In 1866 it fell to Prussia, along with the duchy of Schleswig-Holstein. Pop. in 1900, 48,937.

FLERS, a town of France, in the department of Orne, 37 miles north-west of Alençon. It contains the remains of a fine old castle, built of granite, in good preservation, and has manufactures of linen, damask, fustian, and particularly of ticking, which, in the town and neighbourhood, employs many hands. It has also bleach-works, &c. Pop. (1896), 11,108.

FLESH, a collective term for the muscular parts of animals. The constituents of flesh consist chiefly of fibrin, with albumen, gelatin, hematocin, fat, phosphate of sodium, phosphate of potassium, phosphate and carbonate of calcium, sulphate of potassium, and chloride of sodium; and it is permeated by an acid fluid, called flesh-juice. It has a red colour, and contains dissolved a number of organic and inorganic substances. The organic matter consists of

albumen, casein, creatine and creatinine, inosic, and several other acids; the inorganic, of alkaline sulphates, chlorides, and phosphates, with lime, iron, and magnesia. The juice is best extracted by water, and this cold extract, with the addition of some salt and a few drops of hydrochloric acid, is recommended by Liebig as a highly nutritious drink for invalids. The extract must be made with cold water; if hot water be used the albumen coagulates on the outside of the flesh, and prevents the solution of the juice. Heating the cold extract also spoils it, as the albumen and other nutritious parts are precipitated.

FLESH-FLY. See **FLY**.

FLETA, the name given by the author to a commentary upon English law, for the reason that it was written in the Fleet Prison. The author's name is unknown, and the date of the work can only be inferred from internal evidence, but this makes it pretty certain that it was composed about the middle of the reign of Edward I., for it contains a reference to the statute Westminster II., which was passed in the thirteenth year of that monarch (1285), and has no reference to the acts passed in the latter years of the same reign. The work is divided into six books, and is intended to form a complete but concise treatise on the state of the law at the time at which the author wrote. He follows Bracton very closely, but supplements and corrects him in accordance with the changes made by Parliament since the appearance of Bracton's work, and he makes large omissions for the sake of brevity. The proœmium of the work is copied from Glanville.

FLETCHER, the name of two English poets, brothers to one another, and cousins of John Fletcher, the dramatist.—1. **GILES**, the author of *Christ's Victory*. He died in 1623, but the date of his birth is not known. It is not known even whether he was the elder or the younger brother. His poem was first published in 1610. A new edition appeared in 1824.—2. **PHINEAS**, author of the *Purple Island* and *Piscatory Eclogues*. He was born about 1584, and died about 1650. The former is an allegorical description of man, founded upon an allegory in the ninth canto of the second book of the *Fæerie Queene*. It is composed in the Spenserian manner, and is not without passages of strong fancy and beauty of description, clothed in smooth and elegant verse. In the first five cantos, however, the reader loses the poet in the anatomist—a character but little adapted to the handling of poetry. When, however, he steps from the physical to the intellectual man, he not only attracts, but secures attention by a profusion of images, many of which are distinguished by much boldness of conception and brilliancy of colouring. His *Piscatory Eclogues* have considerable sweetness of versification, and much descriptive elegance. Milton was indebted to both of these poets in different passages of the *Paradise Lost* and *Paradise Regained*.

FLETCHER, ANDREW, a Scottish political writer and patriot, was the son of Sir Robert Fletcher, of Saltoun. He was born in 1653, spent some years in foreign travel, and first appeared in public life as commissioner for East Lothian in the Scottish parliament. Having distinguished himself in opposition to the court he deemed it prudent to retire to Holland; and on his non-appearance to a summons from the lords in council he was outlawed. In 1683 he came over to England to take measures with the friends of liberty against the designs of James II.; and in 1685 he joined the enterprise of the Duke of Monmouth. While on this expedition, having killed in a quarrel another partisan in the same cause, who had insulted him, the duke dismissed him. He then repaired to Spain, and afterwards to Hungary, where he distinguished himself in a war against the Turks.

He subsequently joined the Scottish refugees in Holland, and when the Revolution of 1688 took place he returned to England with William of Orange, resumed possession of his estate, and became a member of the convention for settling the new government in Scotland. In 1698 he printed *A Discourse on Government in Relation to Militias*; and also, *Two Discourses Concerning the Affairs of Scotland*. In 1703 he opposed a vote of supply until 'the house should consider what was necessary to secure the religion and liberties of the nation on the death of the queen' (Anne), and carried various limitations of the prerogative, forming part of the Act of Security rendered nugatory by the Scottish union, which he vehemently opposed. He died in London in 1716. His tracts and some of his speeches are published in one volume, octavo, entitled *The Political Works of Andrew Fletcher, Esq.* (London, 1737).

FLETCHER, JOHN. See **BRAUMONT** and **FLETCHER**.
FLEUR-DE-LIS. Nothing whatever is known of the origin or true nature of this heraldic emblem. According to some it represents the flower from which it takes its name, either the white lily of the garden or the iris; according to others it represents the offensive part of a halberd, according to others a bee or a toad. What is known about it amounts simply to this, that the flower bearing this name has been recognized at all times and among all peoples as a symbol of greatness and sovereignty, and that from the throne it passed to the nobility, and from them to still lower ranks. The fleurs-de-lis, in the form in which they are used at the present day as a blazon in heraldry, are much older than the Bourbons, and they have never been exclusively the emblem of that house. Some of the great families of France (most of whom are now extinct) bore them on their shields from the very commencement of the practice of blazoning, and a large number of families in Germany, Sweden, Switzerland, the Low Countries, and other parts of Europe, can be shown to have borne the fleurs-de-lis on their coats of arms from the twelfth or the thirteenth century, that is, from the time when the language of heraldry came into use. The great popularity of this emblem in France dates from the thirteenth century. The royal coat of arms of France consisted of three golden lilies on a blue ground, with the device, '*Lilia neque nent neque laborant*.' The shield of France was anciently, in heraldic language, *sémi de fleurs-de-lis*, that is, bore this emblem scattered over the shield. It is commonly believed that it was Charles V. (1364–80) who reduced the number to three; but this is disproved by the fact that two seals have been preserved, the one belonging to Philip the Fair (1285–1314), the other belonging to Philip of Valois (1328–50), both of which bear three fleurs-de-lis; and the town library of Rouen contains a collection of charts relating to the celebrated abbey of Savigny, to one of which, bearing the date 1212, a seal is attached, which is still in a state of perfect preservation, representing three fleurs-de-lis exactly similar to those used on the shield of France. Hence it appears that the use of this emblem in a triple form is much more ancient than is usually thought.

FLEURUS, a town in Belgium, in the province of Hainaut, 7 miles north-east of Charleroi. It has manufactures of coarse woollens and flax, with some tanneries and salt-works, and a trade in agricultural produce. In the vicinity, in Aug. 1622, the Spaniards under Gonzales defeated the army commanded by Ernst von Mansfeld; July 1, 1690, the French under Marshal Luxembourg defeated the Germans under Prince Waldeck; and June 26, 1794, the French republican forces under Marshal Jourdan defeated the Austrian army. The battle of Liézy, also, is sometimes known as the battle of Fleurus.

Ligny being only about 2 miles from Fleurus. Pop. (1800), 6914.

FLEURY, ANDRÉ HERCULE DE, cardinal and prime minister of Louis XV., was born at Lodève, in Languedoc, June 22, 1653, and pursued his studies at first in the college of the Jesuits, at Clermont, whence he was removed to the Collège d'Harcourt, at Paris, in order to study philosophy. He was then made canon of Montpellier and doctor of the Sorbonne. At court he won general favour by his pleasing person and fine understanding; became almoner of the queen and afterwards of the king. In 1698 Louis XIV. gave him the bishopric of Fréjus, and shortly before his death appointed him instructor to Louis XV. In the troubled times of the regency he knew how to retain the favour of the Duke of Orleans, by asking for no favour, and keeping clear of all intrigues. In 1717 he was admitted a member of the French Academy. After the death of the regent in 1723 he proposed the Duc de Bourbon as first minister, but in 1726 he overturned the government which he had himself set up, and from that date kept the direction of affairs in his own hands. In the same year he was made a cardinal. His ministry was a highly prosperous one. The war which he began in 1733 against Charles VI. and the German Empire, on account of the election to the crown of Poland, he ended with glory. By the peace of 1738 he added Lorraine to France. On the other hand, the war of the Austrian Succession was unfortunate for the French. Fleury died before its termination, at Issy, near Paris, January 29, 1743.

FLEURY, CLAUDE, born at Paris, December 6, 1640, was educated in the Jesuit College at Clermont, and after beginning to practise as a lawyer, resolved to take orders. In 1672 he became the tutor of the young princes of Conti, who were brought up along with the dauphin. He was afterwards employed by Louis XIV. to educate his natural son the Count of Vermandois, after whose death in 1683 he had, under Fénelon, the second charge of the princes of Burgundy, Anjou, and Berri, and was appointed abbot of the Cistercian monastery Loc-Dieu. After completing the education of the princes he was rewarded by Louis XIV. with the priory of Argenteuil. In 1696 he succeeded La Bruyère as a member of the French Academy. In consequence of his moderate views during the strife which raged between the Molinists and Jansenists Louis XV. made him his confessor; but this situation he resigned, in consequence of his great age, a year before his death, which happened in 1723. He had procured admission into the Academy in 1696 by several important works, among which the best known are his *Histoire du Droit Français*, *Mœurs des Israélites*, *Mœurs des Chrétiens*, *Institution au Droit ecclésiastique*, *Histoire ecclésiastique*.

FLINT, or **FLINTSHIRE**, a maritime county in North Wales, consisting of two separate portions, a larger and smaller, the former having the Dee on the east, the Irish Sea on the north, and the county of Denbigh on the south and west; the latter, which is distant 6 miles *s.e.* from the main portion, and separated from it by the county of Denbigh, has Cheshire on the *n.e.* and Shropshire on all other sides. Flintshire is the smallest county in Wales, but the most populous in proportion to its extent. The larger portion is about 27 miles long, with an average breadth of 7 or 8 miles; the smaller, 8 miles, by about 5 miles broad; area, 164,164 acres, or 256 square miles. A range of hills of moderate elevation intersects the county lengthways *s.w.* to *n.e.* There are numerous well-watered and fertile valleys, including a portion of the celebrated Vale of Clwyd. The coast is in general low, and skirted by sands, in

some places nearly 4 miles wide, which are dry at low water. Agriculture has made considerable advances in this county of late years, and the condition of the peasantry has much improved. The grains principally cultivated are oats and barley. About 80 per cent of the surface is cultivated, fully half being in permanent pasture. The breed of cattle is small, but they are excellent milkers. Butter and cheese are also made to a considerable extent. The county is rich in minerals, particularly lead, the mines of which are the most productive in Britain. Coal also abounds, and copper is obtained in considerable quantities. The principal smelting works are at Holywell and Mold. Manganese is also worked. Along the estuary for about 14 miles there is a complete line of works for coal, iron, copper, lead smelting, chemicals, ship-building, &c. Flint returns two members to the House of Commons—one for the county, and one for the county town of Flint and its contributory boroughs. It is divided into five hundreds and thirty-seven civil parishes. The Chester and Holyhead Railway, which runs all along the coast, is the chief railway of the county. Pop. in 1871, 76,312; in 1891, 77,277; in 1901, 81,725.

FLINT, a parliamentary and municipal borough, market town, and seaport, North Wales, in Flintshire, on the *s.w.* shore of the estuary of the Dee, 18 miles *s.w.* of Liverpool, at the foot of a steep hill. The houses are tolerably well built, and mostly of brick. It has a handsome parish church in the Gothic style, erected in 1848, and several dissenting chapels; and a substantial town hall and market-house. The county jail was founded in Flint, but is now at Mold. In the vicinity are extensive alkali works, in which the bulk of the population are employed, and there are also coal-mines. The only other industry of importance is the manufacture of paper. The shipping trade of the port is very small. A little *n.e.* of the town, on the shore of the estuary, stands the ancient castle of Flint, an object of some historical interest. It was completed by Edward I., and was the prison of Richard II. It has remained in ruins since 1667. Flint is a station on the Chester and Holyhead Railway, which passes through the town at a small elevation. The town, with several other contributory boroughs, sends a member to Parliament. Pop. in 1801, 5247; in 1901, 4624.

FLINT, a variety of quartz which occurs of all colours but generally yellowish and dark gray, commonly in a compact amorphous body. It forms nodules or layers which are usually found in limestone. It consists of 98 silica, 0.50 lime, 0.25 alumina, 0.25 oxide of iron, and 1.0 loss. Some specimens also contain organic matter, and frequently inclose small quantities of pyrites and other minerals. It scratches common quartz, but is rather brittle and has a fine conchoidal fracture. It is translucent, with a lustre between that of glass and resin. When heated it remains infusible, but becomes white and opaque, and if, when red hot, it be plunged into water it falls to pieces, and can then be ground in a mill to an impalpable powder. When struck against a hard object, such as a piece of steel, small fragments, incandescent by the friction, fly off. This, before the use of lucifer matches, was the only means of striking a light, the sparks being made to fall upon tinder. The light from a stream of sparks produced by making a wheel strike on a piece of flint was employed in mines before the Davy-lamp was introduced. But its principal use, before the invention of percussion caps, was for gun flints. The manufacture of gun-flints was exceedingly simple, and a good workman could make 1000 a day. The whole art consisted in striking the stone repeatedly with a kind of mallet, and bringing off at each stroke a splinter sharp at one

end and thicker at the other. The splinters were afterwards shaped at pleasure by laying the line at which it was wished they should break upon a sharp instrument, and then giving it small blows with a mallet. This manufacture, which was once largely carried on, is all but extinct. Calced and finely ground flint is largely employed instead of sand in the manufacture of glass, and especially of porcelain. When dissolved under pressure in caustic soda it forms silicate of sodium, which is used for artificial stone-making, for coating masonry with a coating impervious to wet, and for silicious painting. See QUARTZ.

FLINT IMPLEMENTS. Such have been found of a rude form in all parts of the world, cut into various shapes, to adapt them to the various purposes for which they were intended. A sufficient account of these will be found under the headings CELTS and ELF-ARROWS.

FLOATING BATTERIES. The most notable attempt to make use of floating batteries against maritime fortresses, till the time of the Crimean war, was during the siege of Gibraltar in 1782, when batteries of this description, invented by the Chevalier d'Arçon, were employed at first with considerable effect. On this occasion, however, they turned out in the end a complete failure, being destroyed by the red-hot shot which General Elliot (afterwards Lord Heathfield) directed against them from the fort. After this failure no more attention was paid to them until Napoleon III. suggested the use of floating batteries, protected by iron plates, in attacking the Russian fortresses in the Black Sea and the Baltic. The suggestion was actually carried out, and the floating batteries then constructed proved very effective in 1855, during the operations against Sveaborg (Aug. 9-10), and Kinburn (Oct. 17), as well as on subsequent occasions. These batteries were of a rectangular form, 174 feet in length, 46 in breadth, and $16\frac{1}{2}$ in depth from the bottom of the hold to the deck, and they drew from $8\frac{1}{2}$ to 9 feet of water. They were protected by iron plates from 3 to 4 inches thick, and carried sixteen rifled cannon of the largest calibre. They were propelled by steam, and on account of their comparatively small draught of water, could generally be brought within easy range of the object of attack. Their armour was found to be a sufficient protection against the most powerful artillery that could then be brought to bear on them, but the immense improvements that have recently been made in the construction of rifled cannon have necessitated the use of much stronger armour than was at first used, and have led to the development of these batteries into the powerful iron-clads of the present day.

FLOATING BREAKWATER. See BREAKWATER.

FLOATING DOCKS. See DOCKS.

FLOATING ISLANDS. These are sometimes seen in lakes or at the mouths of rivers, and are now known to be nothing else than fragments of the land broken loose from the shore, held together by the interlacing roots of trees and other plants; or they are accumulations of drift-wood on which earthy matter has gathered sufficient to afford nourishment to plants. Such islands, it need hardly be said, are of no great size, and have usually a very fleeting existence. Loch Lomond, in Scotland, was once celebrated for its floating island, but this has long ago settled down and become stationary. But perhaps the most celebrated of all are the floating gardens of Mexico, called *chinampas*, which are formed by art. Scarcely less remarkable are the artificial floating islands of the marshy valley of Cashmere. These are used for the cultivation of cucumbers, melons, &c.

FLOATING QUARTZ, a porous variety of quartz met with in Cornwall and near Paris, consisting of interlaced fibres forming a mass which floats in water by being buoyed up by the air it incloses. It contains 98 per cent of silica and 2 of carbonate of calcium.

FLODDEN, a village in Northumberland, about 5 miles s.w. of Coldstream, near which was fought the celebrated battle in which James IV. of Scotland was defeated by the Earl of Surrey (Sept. 9, 1513). See SCOTLAND (HISTORY OF).

FLOOR-CLOTH. The basis of floor-cloth is a strong, open canvas, woven of flax, with a slight admixture of hemp. Owing to its great width, 6 to 8 yards, it has to be woven in special looms. It is made in lengths of from 100 to 113 yards. A length of 60 to 100 feet is stretched in a frame, brushed with glue-size, and rubbed with pumice-stones. It then receives two or three foundation coats of paint on each side. This is a thick paint, commonly made of linseed-oil and ochre, and is laid on with a trowel. Each coat on the front is smoothed with pumice stone. When this operation is completed the cloth is transferred to the printing-room, where the pattern is printed by blocks, as in calico-printing. There is a block for each colour. The raised part of the block, instead of being continuous, consists of congeries of little points or teeth. The colours are found to lie more evenly when presented in this way than when applied by a smooth surface.

FLORA, the Roman goddess of flowers and spring, whose worship was established at Rome in the earliest times. She is represented as a beautiful female, with a wreath of flowers on her head; or in her left hand; in her right hand she generally holds a cornucopia. Her temple at Rome was situated near the Circus Maximus, and her festival, the Floralia, was celebrated from April 28 to May 1 with much licentiousness. The later Romans identified Flora with the Greek goddess Chloris. In botany, *Flora* signifies the plants of a region collectively, as *Fauna* signifies the animals.

FLORAL GAMES. See JEUX FLORAUX.

FLORAL (month of flowers), the eighth month in the calendar of the French revolution. It began April 20, and ended May 19. See CALENDAR.

FLORENCE (in Italian, *Firenze*), a province of the Kingdom of Italy, in that portion of it known as Tuscany; area, about 2262 English square miles. The surface is beautifully diversified by mountains, valleys, and plains. On the north and north-east it is covered by the north Apennines, and on the east by the central Apennines and the Tuscan sub-Apennines. Inclosed by these mountains lies the beautiful valley of the Arno, watered by the river of that name, and opened into by numerous minor lateral valleys, each drained by its tributary streams. The climate is generally mild and healthy, and the soil very fertile, producing wheat, maize, beans, and all kinds of leguminous crops. The vine, olive, orange, citron, and fig thrive well in the low grounds; while the mountainous districts afford excellent pasture, admirably adapted for the rearing of sheep. The minerals include mines of copper, lead, and mercury; and quarries of marble, alabaster, and fine building stone. Pop. (1898), 832,819.

FLORENCE (Italian, *Firenze*; in old Italian and in poetry, *Fiorenza*; ancient, *Florentia Tuscorum*), a city of Italy, capital of the above province, 143 miles north-west from Rome, and 50 miles s.w. from Leghorn. The city is beautifully situated, nearly surrounded by hills, those on the north being of considerable altitude. Populous suburbs lie beyond the line of the old walls, and the neighbouring heights are covered with villas. It is intersected by the Arno,

which divides it into two unequal parts, the larger being on its north bank. The river varies here in width from about 100 to 150 yards, and is crossed by four bridges. One of these, the Ponte della Santa Trinità, is of marble, and remarkable for its lightness and elegance; it is formed of three elliptic arches, and is adorned with statues. The Ponte Vecchio, reconstructed in 1862, consists of three arches, has a range of shops on each side of the roadway, and above a covered way that serves to connect the Pitti Palace with the Uffizi and the Palazzo Vecchio. The oldest of the bridges, however, is the Ponte Alle Grazie (1237). There are, besides, a suspension bridge, and an iron girder bridge. On either side of the Arno is a spacious quay, called the Lung' Arno, a favourite promenade of the Florentines. To the west of the town lies the public park, called the Cascine, which is two miles long. The city was surrounded by old walls, which have now been almost entirely removed, with the exception of the gates. Among the modern improvements is the construction of the carriage-way, called the Viale dei Colli, on the left or south bank of the river, from the higher levels of which magnificent panoramic views of the city are obtained. The streets are generally narrow, but are clean, and well paved with thick flagstones, chiselled into grooves. Electric, steam, and horse tramways traverse the chief thoroughfares. The private dwellings are mostly handsome, and the palaces, of which there are many, are noble and impressive structures, though somewhat gloomy. Many of these mansions are magnificently fitted up, and contain extensive libraries, and valuable collections of works of art. The city contains numerous piazzas or squares, the most important of which, and the centre of public life, is the Piazza della Signoria, surrounded by important buildings, and adorned with a marble fountain and a bronze statue of Cosmo I. In this piazza is situated the Palazzo Vecchio, originally the seat of the government of the republic, and subsequently the residence of Cosmo I. It is a grand but gloomy building, with a lofty machicolated tower, the whole possessing a very distinctive architectural character. The most remarkable building in Florence, and perhaps the most remarkable of the kind in Europe, is the Duomo, or cathedral of St. Maria del Fiore, erected 1294-1462, though the façade was only completed in 1887. It is situated in a spacious square near the centre of the city. The walls are of brick, and its whole exterior is cased with black and white marble, in alternate courses, while its floors are paved with the same material, of various colours. The Duomo, begun at the end of the thirteenth century by Arnolfo di Cambio, was continued by other successive architects, and practically completed in the fifteenth century by Brunelleschi, who erected its vast dome. The dome is one of the largest in the world. The campanile, or bell-tower, designed and begun by Giotto in 1334, is a square structure of great elegance, incased with marbles, in the style of the cathedral, 292 feet high, and adorned with a number of reliefs representing the progress of civilization. Near the cathedral is the small octagonal church of St. John (San Giovanni), now used as the general baptistery, the three bronze gates of which, with figures in high relief, are celebrated as among the most beautiful works of the kind extant. One of these is by Andrea Pisano, the two others by Ghiberti; the latter were said by Michael Angelo to be worthy of being the gates of paradise. None of the other churches exhibits any remarkable architectural excellence, though some possess fine cloisters. In many instances their internal decorations are imposing, and they contain many valuable works of art.

The church of Santa Croce, the rich front of which was completed in 1857-63, in light marble from the old design, is the burial-place of many of the most eminent Tuscans, and contains much fine sculpture and many interesting tombs, amongst others those of Michael Angelo Buonarroti, Galileo, Machiavelli, and Alfieri. In the Piazza S. Croce stands Dante's monument by Pazzi, inaugurated with great solemnity on the six-hundredth anniversary of the birth of the poet, 14th May, 1865. The proudest boast of Florence, however, is its grand gallery, the Galleria degli Uffizi, near the Piazza della Signoria. It occupies the upper story of a fine building, called the Palazzo degli Uffizi, erected by command of Cosmo I., after a design by Vasari, and situated near the centre of the city. The prevailing order is the Italian or modern Doric. In its form it consists of three sides of a lengthened parallelogram, resting on a noble loggia, the internal niches of which are adorned with marble statues of celebrated Tuscans. In this gallery are contained specimens of painting and statuary by the greatest masters in these arts. In statuary, among numerous antiques may be specified the Venus de Medici, the Apollino, the Knife-grinder, the Dancing Fawn, the Wrestlers, and the group of Niobe and her Children; and in painting there are works by Michael Angelo, Raphael, Titian, Fra Angelico, Fra Bartolommeo, Andrea del Sarto, Correggio, Guido, and numerous others of the first names in various schools. The Pitti Palace, situated on a rising ground on the south side of the river, is an edifice almost unrivalled in its simple grandeur. Built for Luca Pitti, the powerful opponent of the Medici, it is now a residence of the King of Italy. It contains the highly renowned collection of pictures that bears its name, consisting of above 500 works, many of them by the most celebrated masters, and all in excellent preservation. Immediately behind the Palazzo Pitti are the Boboli gardens, about 1½ mile in circumference. They were first planned in 1550 by Tribolo, under Cosmo I. They are laid out in long embowered walks and open glades, adorned with magnificent laurels, cypresses, yuccas, &c., and are enriched with terraces, statues, and vases, including four unfinished figures by Michael Angelo. The building commonly known as the *Bargello*, an imposing structure erected about 1250 for the chief magistrate of the republic, and subsequently used as a prison, has latterly been restored, and is now open as a national museum, illustrative of the history of Italian culture and art in medieval and modern times. The Laurentian or Medicean Library, a long and lofty gallery, with beautiful windows of stained glass, contains upwards of 10,000 ancient MSS., equalled in importance by no collection except the Vatican. The National Library contains about 300,000 volumes and 8000 MSS., and is the chief library of the city. It is in the same building as the Uffizi Gallery. There is a third library, called the Biblioteca Marcucelliana, composed of a large and excellent collection of books, founded in 1703, by Abbot Francesco Maruocelli. The Biblioteca Riccardiana is a fourth public library. It was founded in the end of the sixteenth century by Riccardo Romolo Riccardi. It contains 28,000 volumes and 3800 MSS., more especially belonging to the literature of the middle ages. As already mentioned, the private libraries of Florence are numerous and extensive. The charitable institutions are numerous and important, some of them manifesting, in a very remarkable manner, the wide and active benevolence of the Italian character. Several of these institutions are of very ancient date; one of them, called the Confraternità della Misericordia, has been in existence for 500 years. Schools, and other literary

and educational establishments, are also numerous. The most eminent of the literary societies is the *Accademia Della Crusca*, a society of Italian philologists, who compiled the great dictionary of the Italian language, and have also published very correct editions of several Italian classics. We may also mention the *Accademia dei Georgofili* (an agricultural society), the *Società Promotrice della Belle Arti*, which has annual exhibitions of painting and sculpture, and the *Società Filarmonica*. The *Istituto di Studi Superiori* possesses the ordinary university advantages, and confers various degrees. Among the scientific collections the museum of natural history is the richest, and possesses an admirable anatomical collection, chiefly of models in wax. There are also an observatory, a botanic garden, &c. The manufactures of Florence have greatly fallen off, but still silkworms are reared, and woollens, silk, straw-hats, porcelain, mosaics, and *pietra dura* are manufactured, and likewise numerous objects in the fine arts. It has ample railway connection with the other cities of Italy. The charms of a residence at Florence are many. More powerful than the remembrance of its military glory, of its heroes in the middle ages, and the great council assembled here in 1478, is the reflection, that arts and sciences first revived here, and commenced the regeneration of Europe. The most celebrated names in Italian literature and art are of Florentine origin. Refinement, genius, and taste rendered the age of Lorenzo de' Medici one of the most brilliant in history, and took root so deeply as to be still conspicuous in the city where he ruled. The language of even the lower people is pure and graceful, and full of delicacy and expression. Generally speaking, the people are lively, polite, social, devout, and, like other Italians, fond of the theatre, but, in industry and dexterity, surpassing most of them.

Florence owes its origin to a colony of Roman soldiers sent thither by Octavianus after the victory of Perugia, to whom he allotted part of the territory of the colony of Fiesole, established about 40 years before by Sylla. Little more is known of it under the empire, and hardly any remains exist of that period, except some relics of an amphitheatre and a few inscriptions. Christianity was established here in the third century, and early in the fourth a Bishop of Florence attended a council at Rome. In the beginning of the twelfth century the city had risen into importance through the industry and enterprise of its inhabitants, who had now commercial establishments in the Levant, France, and other parts, and had become money-changers, money-lenders, jewellers, and goldsmiths. In the latter end of the fourteenth century the wealthy family of the Albizzi became chief rulers in Florence. These again were overthrown in 1434 by Cosmo de' Medici, a popular citizen and princely merchant, who assumed the first place in the state. On the fall of the republic in the sixteenth century a member of a lateral branch of the Medici, the line of Cosmo having become extinct, was placed by Charles V. as Duke of Florence. The ducal dynasty of Medici continued to rule till the year 1737, when, becoming extinct, they were succeeded by Francis of Lorraine, afterwards emperor of Germany. From this period the history of Florence merges into that of Tuscany, until its amalgamation with the Kingdom of Italy. From 1865 till 1871 it held the dignity of capital of the kingdom, the seat of government being transferred to it from Turin. It then received a considerable increase of population, and consequently a number of broad new streets have been constructed on the site of the old fortifications, and of late years its precincts have been extended in every direction, affording the best

proof of its prosperity. Amongst the illustrious men it has produced are Dante, Petrarch, Boccaccio, Guicciardini, Lorenzo de' Medici, Galileo, Michael Angelo, Leonardo da Vinci, Benvenuto Cellini, Andrea del Sarto, Amerigo Vespucci, and others. Pop. (including suburbs), in 1901, 204,950.

FLORENTINE WORK, a kind of mosaic work, consisting of precious stones and pieces of white and coloured marble, for which the Florentines were distinguished, and which is still practised. It is applied to jewelry and various ornamental articles, including table-tops.

FLORES, or **FLORIS**.—1. *Endé* or *Mandjrei Floris*, a large island of the Indian Archipelago, forms one of the chain of islands which extend east from Java; length, above 200 miles; breadth, about 50 miles. It has a mountainous surface, with several volcanic peaks, one of which, Lobetobie, is 7200 feet high. Little is known of the interior. Sandal-wood, once abundant, has become scarce. *Endé*, near the middle of the south coast, is said to be the principal port, and to have safe anchorage for any number of ships. The passage between the east end of the island and those of Solor and Adenara is called Flores Strait; and the part of the Pacific north of the Flores chain and south of Celebes is called the Flores Sea.—2. The most western island of the Azores, about 30 miles long by 9 miles broad, with a hilly surface, containing an extinct crater now converted into a lake. The chief products are wheat, pulse, and poultry, and great numbers of small cattle are reared.—3. An island of the North Pacific, off the west coast of British America, opposite to Vancouver's Island; lat. 49° 40' N.; lon. 125° 45' W.; length, north-west to south-east, 15 miles; breadth, from 2 miles to 6 miles.

FLORIAN, JEAN PIERRE CLARIS DE, a graceful French writer, was born in 1755 at the castle of Florian, not far from Sauve, in the Lower Cevennes. His predilection for Spanish literature was derived from his mother, Gilette de Salgues, a native of Castile. The taste for the age of chivalry and its customs, which animates the romantic poetry of the Spaniards, is clearly to be recognized in his works. His earliest dramatic works were represented at a private theatre in the house of D'Argental, a friend of Voltaire, to one of whose nieces Florian was married. One of them, called *Les deux Billets*, is still a favourite. At the same time he distinguished himself by his poem called *Voltaire et le Serf du Mont Jura*, and the eclogue of Boaz and Ruth. His *éloge* of Louis XII. was less successful. In 1788 he became a member of the French Academy. After the death of the Duke of Penthièvre he retired to Soeaux, in consequence of the decree banishing all nobles from Paris. While there, engaged in finishing his poem Ephraïm, he was arrested by the orders of the committee of public safety. The fall of Robespierre saved him from the guillotine, and gave one of his friends an opportunity to obtain his liberation; but his sufferings, and particularly the dreadful suspense which he had endured for a long time, had entirely exhausted him. He died soon after leaving the prison, at Soeaux, September 18th, 1794. As a poet Florian exercised his talents successfully in more than one department. Facility, grace, harmony, and a sensibility rare in the French character are the most striking characteristics of his works. In elevated subjects he is deficient in fire, strength, and colouring. His descriptions of manners are striking and faithful, particularly his pictures of pastoral life, as, for instance, in his favourite *Estelle*. As a writer of fables he ranks immediately after La Fontaine. Voltaire called him by the tender name of *Florianet*, which paints in a striking manner the species of

poetry to which the genius of Florian is adapted, and to which belong his *Galatée* (imitated from Cervantes), *Fables*, *Contes en Vers*. His principal prose tales are *Estelle*, *Gonzalve de Cordoue*, *Numa Pompilius*, and, among his dramatic works, the above-mentioned *Deux Bilets*. His *Don Quichotte* may be read as a French original, and is highly interesting, however little it may be esteemed by later translators of Cervantes' masterpiece.

FLORIDA, a peninsula and state in the United States of North America, having the states of Georgia and Alabama on the north; the Gulf of Mexico on the west; the Atlantic on the east; and the Gulf of Florida on the south; length, about 330 miles; average breadth, about 90 miles; area, 58,680 square miles. The surface is in general level, rising little above the sea, especially in the southern part, where it is almost one continued swamp or marsh. The northern portion is more broken and elevated, but the whole coast is flat, and skirted by low, narrow islands of sand, which lie parallel to the mainland, and are separated from it by shallow unnavigable lagoons. In the south of the peninsula there is an extensive swamp known as the Everglades, which is overgrown with sub-tropical plants. The principal river is the Apalachicola; the next in importance are the St. John's, Withlacoochee, Kissimmee, Suwannee, and Chattahoochee. The entrance to most of the rivers has a bar that unfits them for the navigation of vessels drawing much water, but they are navigable by steamers and other vessels of light draught. There are a great many lakes throughout the peninsula, most of them being shallow. The largest is Okeechobee, now partly drained. Numerous islands are scattered along the whole coast, the most remarkable of which is a group called the Florida Keys, stretching out for more than 100 miles south and west of Cape Florida, and much dreaded by mariners. There are also several spacious bays and many good harbours; they are mostly on the west coast, and include Chatham Bay, Charlotte Harbour, Tampa Bay, and Wacassassa Bay on the peninsula, with the bays of Apalachee, St. Joseph, St. Andrew, Chactawhatchee or St. Rosa, Pensacola, &c., on the mainland. On the Atlantic coast the chief harbours are St. Augustine, the mouths of the St. John's and St. Mary's rivers, and Biscayne Bay. Key West, one of the islands, has an excellent harbour. Although there is comparatively little cultivable soil in this country, what there is, especially that on the banks of the rivers, is of remarkable fertility, and, aided by a favourable climate, produces tropical plants and fruits in great perfection; cotton, olives, pumpkins, and melons also succeed well. The planting of orange groves has been carried on extensively in recent times, and oranges are now a specialty of Florida. Tobacco also is grown, and sugar, maize, potatoes, oats, &c., are the other principal productions. The pine barrens produce grass, on which immense numbers of cattle are reared. The pine forests are of great extent, and the trees of extraordinary height and beauty. White cedar, cypress, and live-oak abound, the latter attaining great perfection. The cabbage-palm is also common. The climate in general is excellent, and the state is now much frequented as a winter health resort for invalids. Florida is not rich in minerals, phosphate rock being the only one found in any quantity. The wild animals consist of wolves, wild cats, panthers, raccoons, opossums, and the common brown bear, which is sometimes seen in the swamps. Rabbits and squirrels also abound. Birds are extremely numerous and various, including vultures, hawks, turkeys, herons, cranes, cormorants, pelicans,

egrets, paroquets, snipe, plovers, flamingoes, &c. The coasts, rivers, and lakes swarm with fish, including mullet, shad, bass, sheepshead, sea-trout, pompano, &c., and sea-turtles and terrapins also abound. The swamps and other inland waters are infested with alligators. Snakes are numerous, but most of them are harmless. The manufactures of the country consist chiefly of cigars, palmetto fibre goods, cotton, coontie (a sort of flour), carriages, and wagons. Sponge fishing is extensively carried on. The principal exports are cotton, sugar, oranges, and timber, chiefly live-oak, for the government navy-yards. Florida has recently made great advances in prosperity; and being now well supplied with numerous railways, towns are rapidly springing up. The chief towns and seaports are Tallahassee, the capital and seat of government; Key West, an important naval station; St. Augustine, Jacksonville, and Pensacola, also a naval station. Florida is divided into forty-five counties. It was discovered in 1497 by Sebastian Cabot, sailing under the English flag; explored in 1512 and 1516 by Ponce de Leon, a Spanish adventurer; and in 1539 overrun with an armed force by Hernando de Soto, governor of Cuba. About the middle of the sixteenth century some French Protestants sought a refuge from persecution in Florida, but their attempts to found a colony were not fortunate. They were attacked by the Spaniards, and in the contests which ensued, after alternate successes the latter were victorious. Florida was ceded to Great Britain by Spain in 1763 in exchange for Cuba; reconquered by the Spaniards in 1781; and confirmed to them at the peace of 1783. It was ceded to the United States in 1819, and in 1845 was admitted into the Union. In 1861 the greater part of the state seceded from the Union, but was readmitted in 1868 after the subjugation of the Confederate States. Pop. in 1880, 269,493; in 1890, 391,422; in 1900, 528,542.

FLORIDA BLANCA, JOSEFO MOSINO, COUNT or, Spanish minister in the reign of Charles III., was born at Hellin, in Murcia, in 1729; died at Seville on Nov. 20, 1808. He studied in the University of Salamanca, and soon rendered himself so conspicuous that he was intrusted with the important post of Spanish ambassador at Rome during the pontificate of Clement XIV. In that office he displayed great ability in several emergencies. He particularly distinguished himself by his activity in the abolition of the order of the Jesuits, and in the election of Pius VI. Charles III., finding himself obliged to dismiss Grimaldi, the minister of foreign affairs, desired him to nominate his successor. Grimaldi recommended Moñino, who at once acquired almost unlimited authority in Spain. He introduced post-coaches, and caused the post-roads to be made practicable; directed his attention to the most important subjects of general police, particularly in the capital; embellished Madrid, and was on every occasion the active friend of the arts and sciences. His attempt to secure the succession to the throne of Portugal to a Spanish prince proved abortive. His attack upon Algiers in 1777, and the siege of Gibraltar in 1782-83, were unsuccessful; but the result of his co-operation with the English colonies of North America in securing their independence was more favourable to Spain. A short time before the death of King Charles III. (December 1788), he requested permission to retire, and presented to the king a justification of his ministerial career. The king expressed himself satisfied with the latter, but refused to accept his resignation. After the accession of Charles IV., however, his enemies, among whom was the Prince of Peace, succeeded, in 1792, in effecting his disgrace. He was

imprisoned in the citadel of Pampeluna, but was soon restored to liberty and banished to his estates. He appeared once more upon the political stage in 1808, when he was president of the extraordinary Cortes.

FLORIN is sometimes used for a coin, and sometimes for a money of account. The silver florin coin is of different values. The silver florins of Holland are worth about 1s. 8d. The British and Austrian florins are each worth 2s. The English florin was first coined in 1848. There are now also double florins.

FLORIS, FRANS, a painter, whose family name was Vriendt, was born at Antwerp in 1520. He was called by his contemporaries the *Raphael of Flanders*. He studied the art of painting under Lombard, at Liège. The pupil soon surpassed his master. After his return to Antwerp Floris established a school for painters in that city. He afterwards went to Italy, where his taste, particularly in design, was improved by the study of the masterpieces of Michel Angelo; but he never equalled the grace and purity of form which distinguished the Florentine and Roman masters. His style was grand; but his colouring and his figures are reproached with dryness and stiffness. After his return to his native country he was engaged to execute important paintings, and soon acquired a considerable fortune, which he squandered by his excesses. He boasted of being the boldest drinker of his time, and, to sustain his reputation, drank on the most extravagant wagers. His intemperance brought him to an early grave. Most of his works, and in particular his triumphal arches, made on the occasion of the entry of Charles V. and Philip II. into Antwerp, and his Twelve Labours of Hercules, have often been engraved by skilful artists. His paintings are to be met with in Flanders, Holland, Spain, Paris, Vienna, and Dresden. He died at Antwerp in 1570.

FLORUS, ANNAEUS, a Roman historian, was probably a native of Spain or Gaul. He is variously styled in the MSS.; in some *L. Annaeus Florus*, in others *L. Julius Florus*, in others *L. Annaeus Seneca*, and in one simply *L. Annaeus*. He lived in the beginning of the second century after Christ, and wrote an abridgment (epitome) of Roman history in four books, from the foundation of the city to the first time of closing the Temple of Janus, in the reign of Augustus. His style is florid, and not sufficiently simple for history. Some are of opinion that the work of Florus belongs to the age of Augustus, but that it has come down to us with interpolations in facts and language. The best edition is that of Duker (Leyden, 1744); later ones are by Titzze (1819) and Seebode (1821).

FLOTSAM, JETSAM, AND LIGAN, in law. *Flotsam*, or *floatsam*, is when a ship is sunk or cast away, and the goods float on the sea. The goods belong to the crown, unless claimed by the owner within a year and a day. *Jetsam* is when a ship is in danger of being sunk, and in order to lighten the ship, and thereby attempt to bring her off, the goods are thrown overboard. *Ligan* is when the goods so cast into the sea are so heavy that they sink to the bottom, and therefore the mariners fasten to them a buoy or cork, or such other thing as will not sink, to enable them to find them again.

FLOUNDER, a common name for several fishes of the genus *Pleuronectes*, type of the family Pleuronectidae, or flat-fishes, but usually applied to the *Pleuronectes flesus*. It is especially found in the northern seas, in the Atlantic, the German Ocean, and the Baltic, and being one of the few flat-fishes which are found in fresh water it abounds in the rivers of England, Holland, Germany, and the north-west of France. Its length seldom exceeds 1 foot, and its

greatest breadth is usually about one-third of its length. Its colour varies, according to the situation in which it is found, from dark to light brown, and it is always marked with spots of a darker colour. The fins are uniformly of a lighter colour than the body, but the spots are darker. The blind side of the fish has small black spots on a light yellow ground. This fish is known in Scotland by the name of *fluke*. See illustration at ICHTHYOLOGY.

FLOUR, the edible part of wheat, or any other grain, reduced to powder, and separated from the bran and the other coarser parts by sifting. See MILL.

FLOUR, St., a town in France, in the department of Cantal, 33 miles east by north of Aurillac. It consists of the town proper, occupying a plateau with precipitous sides, and of a suburb communicating with it by a winding road out in the rock. It contains an ancient cathedral, a Jacobite convent, a Jesuits' college, &c. The manufactures consist of leather, glue, copperware, lace, and pottery; and the trade is in grain and mules. Pop. 5218.

FLOURENS, MARIE JEAN PIERRE, a distinguished French physician and physiologist, born at Murellhan, in the department of Hérault, April 15, 1794; died at Montgeron, near Paris, December 6, 1867. When scarcely nineteen years old he took the degree of Doctor of Medicine at Montpellier, and shortly after proceeded to Paris, where he connected himself with the great leaders of science at that time, including Chaptal, Georges and Frédéric Cuvier, Destutt de Tracy, Geoffroy Saint-Hilaire, and others, the first three of whom became his intimate friends. His first scientific writings, which were distinguished by their perspicuous style and analytical precision, appeared in 1819. In 1821 he delivered a course of lectures at the *Athénæum* on the physiological theory of sensation, and during the same period contributed to the Academy of Sciences a number of papers on subjects connected with the physiological structure of man and the lower animals, which excited a great amount of interest in scientific circles. He was also a contributor to the *Revue encyclopédique*, and to the *Dictionnaire classique de l'Histoire naturelle* of D'Orbigny. In 1828 he was elected a member of the Academy of Sciences, in 1830 was appointed by G. Cuvier to fulfil the duties connected with the chair of comparative anatomy at the Jardin des Plantes, and, after discharging these duties two years, was himself nominated to the professorship. In 1833 he succeeded Dulong as permanent secretary to the Academy of Sciences. In 1840 he was admitted a member of the French Academy. In 1837 he had been elected to the chamber of deputies by the arrondissement of Béziers. He took his seat upon the left, but did not mix himself up with party politics. In 1845 he received the rank of commander in the Legion of Honour, having been an officer in the legion since 1837, and was at last, August 11, 1859, raised to the rank of grand-officer. In 1846 he was created by Louis Philippe a peer of France, but he was deprived of this dignity by the revolution of 1848. Flourens combined with profound scientific knowledge great literary talent. His works are very numerous, but the following may be mentioned particularly:—*Recherches expérimentales sur les Propriétés et les Fonctions du Système nerveux* (Paris, 1824); *Expériences sur le Système nerveux* (1825); *Développement des Os* (1842); *Anatomie de la Peau* (1843); *Mémoires d'Anatomie et de Physiologie comparées* (1844); *Buffon* (1844); *De l'Instinct et de l'Intelligence des Animaux* (1841); *De la Longévité* (1854); *De la Vie et de l'Intelligence* (1858); *Œuvres de Buffon* (1853–55); *Des Mammifères de Buffon* (1859); *Éloges historiques* (1857). *Flo-*

rens was the first to demonstrate experimentally that the substance of the animal body undergoes a constant process of renewal.

FLOWER, its nature and use. The flower is that part of a plant which is destined to produce the seed. Its organs are of two kinds, namely, the floral envelopes, consisting of the protecting parts or leaves of the flower, and the essential organs. In a complete flower the floral envelopes are double, composed of two whorls or circles of leaves, alternating with each other; the outer series consisting commonly of green or greenish leaves named sepals, and together forming the calyx; and the inner series, of leaf-like parts, usually of a delicate texture, and of some other colour than green, named petals, and together constituting the corolla. The term perianth is sometimes applied to the floral envelopes taken together, but it is generally restricted to those flowers in which only one of the series is present, at least in appearance, as in the lily, with its six petaloid sepals, and in the common marsh-marigold and anemone; or in other instances where the limits of the calyx and the corolla are not easily distinguished. The essential organs of reproduction are the stamens or fertilizing organs; and the pistils, which receive the fertilizing influence and produce the seeds. The stamens and pistils form either two whorls or circles inside of the corolla and calyx, the whole four series being considered as leaves altered to suit the particular functions performed by each circle, and all of them alternating with each other on the principle of alternation which regulates the succession of the true leaves upon the stem. When flowers become double, the stamens and pistils are more or less converted into petals; and a still more remarkable illustration of the leaf-character of the pistil occurs in the double-flowering cherry, in which that organ reverts to the form and colour of the true leaf. The end of the flower-stalk, or the short axis upon which the successive circles of sepals, petals, stamens, and pistils are placed, is named the receptacle or thalamus, which is greatly modified in different plants—the strawberry, for example, being a succulent receptacle, upon the surface of which are scattered the small fruits or achenes, resembling seeds; and the fig being another form of succulent receptacle, in the hollow of which are contained the stamens and pistils. The numbers which commonly prevail in the parts of the flower are 2, 3, and 5, or their multiples. Thus, a flower with 5 sepals in the calyx has usually, alternating with them, 5 petals in the corolla; the number of stamens is 5, 10, or 20; and 5, or a multiple of that number, constitutes the parts of the pistil. Flowers are said to be perfect when they are provided with both kinds of essential organs, namely, stamens and pistils; complete, when they have all the kinds of organs which any flower possesses, namely, calyx and corolla, stamens and pistils; regular, when all the parts of each set are alike in shape and size; and symmetrical, when they have an equal number of parts of each kind, or in each whorl of organs, as in the case stated above. Flowers are called unsymmetrical when the different series of organs do not agree in the number of their parts, of which a familiar illustration occurs in the larkspur. The law of symmetry is frequently interfered with by adhesion, abortion, or non-development of the parts of a flower. Flowers are termed irregular when the different members of the same kind, as, for example, the petals or the stamens, are unlike in size and form, of which the monkshood and the violet furnish examples. Sometimes the corolla is absent, and the flower, having only one envelope, is called monochlamydeous. In other instances both calyx and corolla are wanting. Sometimes the stamens are in one flower and the pistils in another on the same plant,

which is then named monocious; or, in the same species, the stamens are produced by one plant and the pistils by another, when the plant is termed dioecious. Such are the arrangements prevailing in the extensive division of plants called Flowering, or Phanerogamous. In ferns, mosses, lichens, fungi, seaweeds, &c., the reproductive organs are obscure, and the plants of this division are styled Flowerless, or Cryptogamous. See also FLOWERS (COLOURS OF).

FLOWER-CLOCK is a contrivance for measuring time by means of flowers.—Flowers, it is well known, open and shut according to the state of the atmosphere, or according to the length of the day. Some, however, open at certain hours of the day, as, for instance, early in the morning or in the evening, and thus afford the means of indicating the time. If, for instance, flowers are chosen which regularly open one hour and then shut again, and others that open and shut the next hour are placed beside the former, and so on until sunset, we have a timepiece of flowers, such as was constructed by Linnæus.

FLOWER-DE-LIS. See FLAUR-DE-LIS.

FLOWERS, in chemistry, a term formerly applied to a variety of substances procured by sublimation in the form of slightly cohering powder; hence in all old books we find mention made of the flowers of antimony, arsenic, zinc, and bismuth, which are the sublimed oxides of these metals in a more or less pure state. We have also still in use, though not generally, the terms *flowers* of sulphur, of benzoin, &c.

FLOWERS, ARTIFICIAL. These are not a modern invention. Among the ancients the floral wreaths made by the Egyptians enjoyed as great a reputation as, at the present day, do the products of Parisian art. The Romans, also, excelled in the art of imitating flowers in wax, and in this branch of the art attained a degree of perfection which has not been approached in modern times. The Egyptian artificial flowers were made of thin plates of horn stained in different colours, sometimes also of leaves of copper gilt or silvered over. Crassus, renowned for his wealth, gave to the victors in the games he celebrated at Rome crowns of artificial leaves made of gold and silver. In modern times the Italians were the first to acquire celebrity for the skill and taste they displayed in this manufacture, but they are now far surpassed by English and French manufacturers, but more especially by the latter. The perfection which this art has now reached is truly marvellous. From the opening bud to the fully expanded flowers all parts of a plant can now be imitated with the most admirable fidelity.

The first artificial flowers made in modern times in civilized countries were manufactured out of diversely coloured ribbons, which were twisted together and attached to small pieces of wire. But these first attempts, although they bore more or less resemblance to what they were intended to represent, were only rude copies. In course of time feathers were substituted for ribbons, a material much more elegant than that previously in use, but one to which it was not so easy to give the requisite shades of colour. The plumage of the birds of South America is admirably adapted for being used by the manufacturer of artificial flowers, on account of the brilliancy and permanence of their tints; and the natives of that quarter of the globe have long practised with success the art of making flowers with feathers. The fine down which is obtained under the wings of young pigeons is specially esteemed for this branch of the industry. The Zoological Gardens in Regent's Park, London, contain a magnificent collection of artificial flowers made out of the feathers of humming-birds. In Italy the cocoons of silkworms are frequently used for the purpose, as these take on a brilliant

colour and have a velvety appearance. Among the other materials used in this manufacture are cambric, muslin, satin, velvet, and other woven fabrics, blown glass, mother of pearl, brass, &c., besides the various vegetable and mineral colouring matters. In South America artificial flowers are even composed of the wing-cases and other parts of some brilliant specimens of beetles. In former times, in the height of the fashionable rage for porcelain, flowers of all kinds were made of that substance, and the odour of the real flowers was imitated by means of perfumes.

FLOWERS, COLOURS OF. The colours of flowers have been arranged in two series, the blue and the yellow, in both of which red and white are found, green being produced by a mixture of the two. It has been estimated that in an average collection of 1000 plants about 284 have white flowers, 226 yellow, 220 red, 141 blue, 73 violet, 86 green, 12 orange, 4 brown, and 2 black. White flowers are more generally odoriferous than those of other colours, and their odours are almost always agreeable. Red flowers, though less numerous than yellow ones, are more often sweet-smelling. The tints are due to fluid or viscous matters contained in superficial cells, and can be separated in certain cases by solution in water, and in others by solution in alcohol and ether. Attempts have been made to refer the colouring matters to one or two principles, which have been described under the names of xanthin, xanthin, anthoxanthin, and cyanin and anthocyan. These bodies, however, are very ill defined, and are, in all probability, mixtures, even supposing that when obtained from different sources they are essentially the same. The chief difficulty is to obtain the colouring matters in sufficient quantity for investigation, and then to separate them accurately from each other, which, as they are amorphous uncrystallizable bodies, is not easy to accomplish satisfactorily. Of the colouring matters from flowers, one of the most individualized is the yellow body got from saffron. See **CROCIN** and **SAFFRON**.

FLOWERS, LANGUAGE OF. In the youthful and imaginative period of nations, flowers, as well as colours and other objects of sense, often have particular symbolical significations attached to them. In Asia, where the imagination is livelier than in Europe, and where the art of writing is not generally practised, the language of flowers has acquired a very distinct character. The seclusion of women in the East, and their ignorance of writing, together with their lively imagination, which personifies every object, must be considered as the chief causes of the invention of this language. The language of flowers is, of course, arbitrary, and a bouquet which a Persian girl would understand would be unintelligible to an Egyptian inmate of the harem. The charm of novelty has sometimes attracted attention in the West to this tender language, and dictionaries have been composed to explain its mysteries. But the European races are too much matter-of-fact people to find pleasure in the habitual use of these emblems, which are, moreover, incapable of expressing the complicated ideas arising in intellectual society.

FLOWERS OF ANTIMONY. See **ANTIMONY**.

FLOWERS OF SULPHUR. See **SULPHUR**.

FLOW OF LIQUIDS. See the article **HYDRAULICS**.

FLUDD, ROBERT, English physician and Rosicrucian, was born in Kent in 1574, his father being Sir Thomas Fludd. He was educated at St. John's College, Oxford, where he graduated as M.A. in 1598, and he afterwards travelled on the Continent in order to prosecute the study of medicine. In 1605 he graduated as M.D. from Christ Church, Oxford, and four years later he became a fellow of

the College of Physicians. He is chiefly remembered as a religious mystic of somewhat pantheistic views and as a champion of the Order of the Rosy Cross. Kepler and Gassendi were among those who wrote against his peculiar opinions. Among his works, which appeared under various pseudonyms, are: *Tractatus Apologeticus integritatem Societatis de Rosae Cruce defendens* (1617); *Tractatus Theologico-Philosophicus* (1617); *Monochordon Mundi Symphonicum* (1622); *Philosophia Sacra* (1626); *Medicina Catholica* (1629-31); &c. In 1638 his works were collected in six volumes.

FLUELLITE, a rare mineral found in small truncated rhombic octahedrons in Cornwall. It is white, vitreous, and transparent, and is said to be a fluoride of aluminium.

FLUENT, in fluxions, the flowing quantity, or that which is continually increasing or decreasing, whether line, surface, solid, &c. See **CALCULUS**.

FLUID. A perfect fluid is defined to be a body which is incapable of resisting change of shape. Commonly the name is applied to a body in the liquid or gaseous condition; in either of which states its parts possess great mobility among themselves. A perfect fluid is an unrealizable conception. All the fluids that we possess—both liquid, however mobile, and gases—do offer finite resistance to changes of shape, if those changes are made rapidly. It is found, however, that they do not offer any *permanent* resistance to change of shape; and this is the case even with bodies that are commonly called *semifluids*, if the change is made slowly enough. Such a body as treacle, for example, if poured into a vessel and left to itself for a sufficiently long time, takes the shape of the vessel perfectly, and finally comes to rest with its surface perfectly level, or at least so nearly level that no test that we can apply indicates any deviation whatever from perfect levelness. It may thus be said that, as far as the statics of fluids is concerned, the fluids that we meet with in nature may be considered as perfect: the *motion* of ordinary fluids, on the other hand, differs widely, in many cases, from the motion of the imaginary perfect fluid. *Viscosity of fluids* is the name given to the internal molecular friction which causes finite resistance in a moving fluid. For information on various questions relating to fluids, see **LIQUID**, **GAS**, **VAPOUR**, **HYDROSTATICS**, **HYDRAULICS**, **VISCOSITY**, &c.

FLUID, ELECTRIC. See **ELECTRICITY**.

FLUKE, or **FLUKE-WORM**, the popular name of various species of flat-worms belonging to the order Trematoda, especially to the family Distomatidae. They are all internal parasites with a complicated metamorphosis, during the progress of which they infest different animals. The most important species is the liver-fluke (*Distoma* or *Distomum hepaticum*), which produces the liver-rot in sheep. The mature animal is about an inch long and half an inch broad, has a flat body somewhat thickened before, and is furnished with suckers and spines. The eggs, of which enormous numbers are produced at one time, develop in water into larvae swimming freely by means of cilia. Some of these larvae penetrate the bodies of individuals of a kind of snail, and become *sporozoites* or oval cells, in each of which is developed an organism known as *Redia*. The *Redia* lives for a time in the snail, and then produces a tadpole-like *Cercaria*. This in turn swims for a time, and then settles on grasses or aquatic plants. If eaten by a sheep it penetrates to the bile-ducts and develops the mature *Distoma* again. This species is sometimes found in man. See **LIVER-FLUKE**, **BOT.**

FLUOCERINE and **FLUOCERITE** are two minerals found at Finbo, in Sweden. The former is a compound of ceric fluoride and oxide, has a yellow

colour and resinous lustre, and occurs massive. The latter is ceric fluoride, and is found crystallized in hexagonal prisms of a dark red or yellow colour.

FLUOR, FLUOR-SPAR, or DERBYSHIRE SPAR. The crystals of this mineral all belong to the monometric system, the cube and octahedron occurring commonly, and a number of intermediate forms being also known. The crystals vary in size; sometimes they are very minute, at others they are several inches in diameter, and cubical crystals a foot through have been met with. Besides occurring in crystals, it forms also columnar and fine grained masses. The fracture is conchoidal and splintery; lustre, vitreous; colour, white, though not very common, and seldom pure; more generally wine-yellow or violet-blue. Among its brightest colours are emerald and pistachio-green, sky-blue, rose-red, and crimson-red. Very dark blue colours, bordering on black, and probably due to foreign admixtures, sometimes occur. Sometimes different shades of colour are disposed in coats parallel to the faces of the cube, or symmetrically distributed along the edges or solid angles of crystals. Translucent as well as transparent; brittle; hardness, between apatite and arragonite, and capable of being scratched with ease by the knife; specific gravity, 3.14. Fluor is composed of 51.3 of calcium and 48.7 of fluorine, and its formula is CaF_2 . Specimens of fluor-spar, however, sometimes contain small quantities of chlorine, sulphate of barium, phosphate of calcium, and fluid matter. Before the blowpipe it decrepitates and becomes phosphorescent, but loses its colour, and melts at last into an opaque globule. It phosphoresces likewise if thrown upon ignited charcoal or heated iron. The light emitted is generally purple, though some varieties afford bright green colours, and, in consequence, have received the name of *chlorophane* or *pyrosomargatus*. A variety of this latter kind, from Ercater-inburg, in Russia, phosphoresces simply from the warmth of the hand. If fluor be exposed to too high a temperature it loses the property of again showing this phenomenon. Sulphuric acid decomposes the powder of the mineral; hydro-fluoric acid is disengaged in a gaseous state, and corrodes glass. Several varieties, particularly the sky-blue and rose-coloured ones, lose their colour on exposure to the light. Fluor is not unfrequently found in beds, as at Alston Moor and Castleton, in England; more generally, however, it occurs in veins in argillaceous schist and secondary limestone, accompanied by galena, blende, calcareous and pearl spars, heavy spar, quartz, bitumen and clay, as at several places in Cumberland and Durham, of the same country. It is also found in primitive rocks accompanying tin ore, mica, apatite and quartz, as at Zinnwald, in Bohemia. The most remarkable deposit of fluor in America, hitherto discovered, is along the country south-west from Cave Rock, on the Ohio, for 30 miles, in Gallatin county, Illinois, where it exists in an alluvial situation, or in veins traversing a compact limestone. Its crystals are often large, and various in their colour: the prevailing tint, however, is a dark purple, approaching black, which is owing to the interfusion of bituminous matter, as is apparent from the odour when the crystals are broken. The chlorophane variety exists very plentifully at New Stratford, Connecticut, where it is accompanied by topaz and magnetic pyrites. The uses of fluor are numerous and important. It is employed as a flux in the reduction of various ores, from which circumstance the name *fluor* has been derived. When employed in metallurgy it not only assists the fusibility of the refractory mineral matter, but it has also been employed for the removal of silica and titanate acid. Fluor-spar is the source of all the hydrofluoric acid

used in the arts for etching upon glass, and this property of the mineral was known two hundred years ago. The acid evolved by the action of sulphuric acid was afterwards repeatedly examined, but the first investigation of importance was that by Scheele, in 1771. He, however, got the acid contaminated with fluoride of silicon, and it was not till some time after that pure hydrofluoric acid was produced. (See FLUORINE.) Formerly the finest specimens of fluor-spar were cut and worn as gems; but their inferiority in point of hardness has brought them into disuse. It still continues, however, when obtained in masses of sufficient dimensions, to be wrought into ornamental objects such as vases, basins, obelisks, &c. This manufacture is confined to Derbyshire, no other part of the world affording fluor sufficiently firm and tenacious for the purpose, and at the same time possessed of such fine colours. The work is performed on a lathe turned by water, the foot-lathe being much more liable to produce fractures in the piece worked, by its want of steadiness. The tool employed at first is a piece of the best steel; after which a coarse stone is applied with water, so long as the smoothness is improved by those means; then the finer gritstone, pumice, &c.; till, finally, the article becomes sufficiently smooth to receive emery, with which the operation is completed. The crevices which frequently occur in the masses of fluor are sometimes concealed by the introduction of galena; and as this substance is often naturally found with the fluor, it becomes difficult to detect the fraud. In selling the articles, also, it is a frequent practice to moisten them with water, under the pretence of removing dust, which is done to bring out the colours otherwise invisible, and which, of course, disappear as soon as the objects become thoroughly dry.

FLUORESCENCE, the name given by Stokes to the appearance presented when rays of high refrangibility are allowed to fall on acid solution of sulphate of quinine and on some other bodies. The term *epipolic dispersion* was given to the same phenomenon by Herschel, and *internal dispersion* by Brewster. Sulphate of quinine, when dissolved in water with the help of a little sulphuric acid, gives a solution clear and colourless by transmitted light; but on looking down into the liquid while it is held in a beam of sunlight, or on looking at it from various positions, the whole mass of the liquid appears suffused with a beautiful bluish cloud, which makes the liquid seem self-luminous. A solution of the bark of the horse-chestnut tree, and many other bodies, possess the same property; and it may often be seen in the common paraffin oil used for burning. Stokes showed that, a tube containing solution of sulphate of quinine being carried along the prismatic spectrum from the red end, 'throughout nearly the whole of the visible spectrum the light passed through the tube as it would have done through so much water, but on arriving nearly at the violet extremity a ghost-like gleam of pale blue light shot right across the tube. On continuing to move the tube the blue light first increased in intensity, and afterwards died away. It did not, however, cease to appear until the tube had been moved far beyond the violet; x-tremity of the spectrum visible on a screen.' When a beam of sunlight is allowed to enter a darkened room by a small hole, and is received on a prism in such a way as to spread the visible spectrum over a length of several feet on a screen at the other end of the room, a very striking appearance is presented if the tube is placed in the dark part of the spectrum, a foot or more beyond the last point where light is distinguishable. Instantly a beautiful blue light is seen in a place where there was absolutely no light before. On examining the light

that comes from the tube when it is in the violet end of the spectrum with the help of the spectroscope, it is found to contain rays extending over a considerable range of refrangibility within the visible spectrum. It appears, thus, that light of high refrangibility falling on a fluorescent body has its refrangibility altered; and there seems to be good reason for supposing that the light is first absorbed by the body, and then given off again in its altered condition.

FLUORINE (chemical symbol, F; atomic weight, 19), a very widely distributed element, which was first isolated by Moissan in 1886. Its most abundant compound is calcic fluoride (CaF_2), which not only exists in the mineral kingdom as fluor-spar (which see), but forms an essential part of the bones and teeth of animals. Fluorine has also been detected in the blood, milk, and urine; in plants; in volcanic sublimates; in rocks; in coprolites and mineral phosphates; and in a variety of minerals, such as cryolite, fluellite and fluorocrite, ytrocrite, apatite, ambygonite, wagnerite, wavelite, rastonite, &c. The difficulty long experienced in isolating fluorine lay in the great chemical activity of the element, for as soon as it was liberated from one substance it combined with another, and attacked the material of which the apparatus was constructed. To avoid this difficulty vessels of gold and platinum, and of fluor-spar itself, have been used. Fluorine was ultimately isolated by decomposing hydrofluoric acid by means of a galvanic current. To the pure hydrochloric acid a little hydrogen potassium fluoride (KHF_2) was added for the purpose of improving its conducting power. It was then subjected, in an iridio-platinum U-tube, to the galvanic current with iridio-platinum electrodes. The gas which was obtained was greenish-yellow, of a disagreeable smell, and possessed of extreme chemical activity. Water is at once decomposed by it with the formation of hydrofluoric acid and the liberation of oxygen, which becomes converted into ozone. Alcohol, ether, turpentine, and benzene take fire when brought into contact with it; cork is also burned, and glass is corroded. It combines readily with hydrogen, even in the dark, and its affinity for potassium and carbon is greater than that of chlorine. Iodine, sulphur, arsenic, phosphorus, and boron all burn in fluorine; and all the metals, with more or less heating, burn in presence of the gas, forming fluorides. Fluorine is always detected by conversion into hydrofluoric acid, and the subsequent action of this acid upon glass.

Hydrofluoric Acid (HF), though its most important property was known in the seventeenth century, was first obtained and studied by Scheele in 1771. As got by him it was contaminated by silicio fluoride; but other observers showed the source of the silica, and the pure acid was ultimately analysed by Gay-Lussac and Thénard, but its analogy to hydrochloric acid was pointed out by Ampère and Davy. The acid is prepared by decomposing a metallic fluoride with an acid, fluor-spar and sulphuric acid being employed in practice. The decomposition is effected in a retort of lead or platinum, and the acid which distills over is collected in a leaden, platinum, or gutta-percha bottle. The acid must not be allowed to come in contact with glass, porcelain, or other material containing silica, otherwise silicio fluoride is formed. Prepared in this way it always contains water. When dry hydrofluoric is wanted it is got by heating difluoride of potassium (KHF_2) in a platinum retort carefully luted, and connected with a platinum bottle or receiver. On heating to redness the acid comes off and condenses in the bottle to a colourless, transparent, mobile liquid, of specific gravity 0.98. It is exces-

sively volatile, and escapes from a bottle containing it with considerable violence. It boils at 19.4°C ., evolving a colourless gas, which fumes in the air, and is extremely deliquescent. The anhydrous acid does not act on glass, but if water be present it is powerfully corrosive. Both act upon the skin with virulence, and great care is necessary in dealing with them. Many experiments have been made with the dry acid as to its action on a great variety of substances, the result being that when a change takes place at all it is of a violent kind, but that in other cases there is little or no effect. Thus, the metals, except potassium and sodium, do not decompose it, nor do the non-metallic elements, whereas different classes of salts act most powerfully. Organic matter is attacked at once; it dissolves in alcohol, but explodes with turpentine. As above said, it has an intense affinity for water, quite as great as that of sulphuric acid; and the solution differs in some properties from the absolute acid. It is still very destructive to animal and vegetable tissues, and its vapour is irrespirable, and even mixed with the air is dangerous to inhale; and it also reacts more in the usual manner with metals and metallic compounds, forming fluorides. It is most remarkable in this state for its tendency to react with silica to form silicio fluoride—a transparent, colourless gas, decomposed by water. Advantage is taken of this, its chief property, both in chemistry and the arts. Hydrofluoric acid is used in chemistry to decompose and dissolve silicates and other refractory minerals which are not acted on by the ordinary acids, when it is desired to avoid fusion by alkalies or alkaline carbonates. The mineral reduced to an impalpable powder is either digested in a platinum dish with successive portions of the acid, or the dish containing the powdered mineral moistened with water is placed on a stand in a larger leaden dish containing powdered fluor-spar and sulphuric acid, which is then closed completely with a leaden lid, and set in a warm place till the decomposition may be deemed complete. In the arts hydrofluoric acid is used, especially for etching upon glass. The glass is covered with wax, the desired pattern is cut through the wax down to the glass, and the plate is then either treated with an aqueous solution of the acid, or of a fluoride and sulphuric acid, or is exposed to the gas itself. After a sufficient length of time the excess of acid is removed, and the wax being dissolved away the pattern which has been etched becomes visible. Various solutions are employed according to the character of the glass to be operated upon, and other circumstances. This use of fluor-spar is said to have been known in the seventeenth century to a German artist, Schwankard by name (who about 1670 discovered the corrosive action of the gas produced by heating fluor-spar with sulphuric acid), and it is the reaction by which fluorine is invariably detected. This and other compounds of fluorine have antiseptic properties.

The fluorides are a large but not a very important class of salts. They are not so soluble in water as the chlorides, but, on the other hand, fluoride of silver is readily soluble. The salts are prepared either by double decomposition or by dissolving a metallic compound or the metal itself in the acid. Some metals, such as copper, not affected by hydrochloric acid, are readily attacked by hydrofluoric acid, and this is particularly the case with the rarer elements tantalum, zirconium, &c. Fluorine, indeed, of which no compound with oxygen, nitrogen, chlorine (!), and perhaps other elements, is known, seems to make up for this want of affinity by an excess of attraction to the rarer elements. With these it forms fluorides or oxyfluorides, and these compounds form with the alkaline fluorides double salts, of which the boro-, silico-,

stanno-, titano-, zirc-, tantal-, and niobio-fluorides, and the molybdo-, tungsto-, and niobio-oxyfluorides are examples. These compounds are not without analogies among the chlorides, the platinum-chloride of potassium, for example, closely resembling the silico-fluoride in constitution. Many of these double salts are isomorphous; but there are exceptions.

FLUSHING (Dutch, *Vlissingen*; French, *Flessingue*), a flourishing seaport town in Holland, in the province of Zeeland, on the south coast of the island of Walcheren, at the mouth of the West Schelde, here between 2 and 3 miles broad, 50 miles s.w. Rotterdam, 38 miles w.n.w. Antwerp. It has long been a place of importance, but has few buildings or institutions of note. The town-house is a roomy, suitable edifice; the exchange is a simple building, and near it is a statue, erected in 1841, of Admiral van Ruyter, born in Flushing in 1607. The inhabitants are chiefly engaged in commerce, for the encouragement of which much has been done in recent times by the construction of docks, &c. There are an outer harbour and two inner harbours or docks of large size, and deep enough for all sea-going vessels, and a deep canal runs from these right across the island. Large passenger steamers ply daily between Flushing and the English port of Queenborough. The manufactures are of considerable importance. After the capture of Briel by the Confederates (the Gueux), in 1572, Flushing was the first town in Holland to raise the standard of freedom. From 1585 to 1616 it was in the possession of the English, as security for part of a loan granted by the English government to the Dutch. Flushing has suffered several times from fire, water, and war, and in 1809 was bombarded by a British fleet, under Lord Chatham, composing the unfortunate Walcheren expedition. The beautiful town-house, built in 1594, several churches, and other important buildings, were then destroyed. Pop. (1894), 14,595.

FLUTE, a portable musical instrument blown with the breath, and consisting of a tube furnished with a number of holes in it for the purpose of varying its sounds. The oldest form of the English flute was called *flûte à bec*, on account of the resemblance of its mouth-piece to the bill of a bird. It had seven holes which could be stopped by the fingers, but it had no finger-keys. This was in use till about the beginning of the eighteenth century, when it gave place to the German flute, an instrument which, in its best form, was 27 inches in length, consisted of four pieces fitting into one another, and had six finger-holes for the normal tones, and from six to twelve keys for the semitones, with a compass of nearly three octaves, counting from middle C upwards, the higher octaves being obtained by overblowing. This form of the flute, though a great advance on the *flûte à bec*, was, nevertheless, incapable of performing certain runs. The improvements made on this instrument, however, by Böhm, a German, acting in conjunction with Gordon, an Englishman, enable the player to perform music on any key, with all the chromatic intervals. The chief improvement consisted in the application of a system of keys, by which several holes could be stopped at one time, by one movement of the finger. The flutes made by Böhm are now taken as the models by most makers in all countries. In modern flutes the number of keys varies. The materials of which flutes are made are box, ivory, ebony, silver, glass, and *bois de grenadille*, a kind of red ebony. The last is said to be the best.

FLUTING, in architecture, channels or furrows cut perpendicularly in the shafts of columns. It seems probable that this kind of ornament had some

relation to the original type; perhaps the furrowed trunk might have suggested the idea. It is, however, a beautiful ornament, which is applied with equal happiness to break the otherwise heavy mass of a Doric shaft, or to obviate an inconsistent plainness in the other orders. When the lower parts of the flutes of a column are filled with a convex bead, they are said to be cabled.

FLUX, a substance or mixture added to assist the fusion of minerals. In the large way, limestone and fluor-spar are used as fluxes. In the smelting of iron great attention has to be paid to the fluxes, because on their character depends to some extent the complete separation of the metal. To accomplish this the flux must be such that it will combine with the earthy matter of the ore, and form a slag, which must neither be too refractory nor fusible. Hence if the ore abound in clay or sulphur, lime or limestone, and possibly sand, must be added; if in quartz, lime and clay are requisite, otherwise the quartz is slagged by combining with part of the iron, which is thus lost. Frequently ores are so selected that the earthy matters present may flux each other, but this requires skill and experience. The fluxes made use of in assays or philosophical experiments consist usually of alkalies and alkaline salts, as borax, microcosmic salt, cyanide of potassium, common salt, which render the earthy mixtures fusible by converting them into glass. Alkaline fluxes are either the crude flux, the white flux, or the black flux. Crude flux is a mixture of nitre and tartar, which is put into the crucible with the mineral intended to be fused. The detonation of the nitre with the inflammable matter of the tartar is of service in some operations, though generally it is attended with inconvenience, on account of the swelling of the materials, which may throw them out of the vessel. A modification of this is called Baumé's flux. It consists of three parts of saltpetre, one of sulphur, and one of saw dust, and when this deflagrates sufficient heat is liberated to fuse a piece of silver. Morveau's flux consists of 40 grains powdered glass free from lead, 5 grains of calcined borax, and 2½ grains of powdered charcoal. This acts both as a flux and as a reducing agent. White flux is formed by projecting equal parts of a mixture of nitre and tartar, by moderate portions at a time, into an ignited crucible. In the detonation which ensues the potassic tartrate is oxidized by the nitre into carbonate, which is the main constituent of the residue. Black flux differs from the preceding in the proportion of its ingredients. In this the tartar is in excess of the nitre, so that the combustion is incomplete, but the excess of tartar is decomposed, carbonaceous matter separates, and the mass thus acquires its black colour. It therefore acts both as a flux and as a reducing agent, and is used in the smelting of metallic ores on the small scale. Black flux is also prepared by simply charring bitartrate of potassium; the salt is converted into carbonate, and is obtained intimately mixed with the carbon, derived from the excess of tartaric acid. Soda flux is sodic carbonate, prepared by heating sodic acetate in a close vessel. The fluxes used in pottery are very various, and are distinguished by different names; but they almost all consist of litharge or red-lead, with sand or boracic acid, sometimes singly, sometimes together. They are therefore essentially colourless glasses used as vehicles for infusible colours.

FLUXIONS. See CALCULUS.

FLY, a term popularly used for most dipterous insects, but more especially given to the very troublesome members of the genus *Musca*. During the summer and autumn much inconvenience is suffered from flies, which settle upon every light-coloured object. The

common house-fly is an absolute cosmopolite, as there has been no part of the world yet visited where it was unknown, and in some countries it exists in such quantities as to create a serious evil. It preys upon every description of animal and vegetable matter, always preferring such as is in a state of putrefaction. Flies are useful as agents in the removal of nuisances, which they effect gradually by their numbers. The flesh-fly deposits its eggs upon animal matter in a state of incipient putrefaction. The *larvæ* or maggots, upon being hatched, devour the substance in which they are placed, and assume the *pupa* state about the time their nourishment is exhausted. Flesh-flies (*Sarcophaga*) are gifted with an extraordinary sense of smell, by which they are enabled to discover the offensive objects upon which they delight to feed at great distances. By this they are frequently attracted to flowers which have a disagreeable smell. The small flies, which are so annoying to horses and cattle during the summer months, were also arranged by Linnaeus in his great genus *Musca*, but now form a genus (*Stomoxys*), which differs from the true flies in having the mouth furnished with a peculiar proboscis, which, when at rest, is carried bent horizontally, but which, when about to sting, the insect places perpendicularly, and pierces the skin, immediately producing a very sharp and disagreeable sensation. The *tsetse*, so destructive to cattle in Africa, belongs to a nearly allied genus, *Glossina*. In the genus *Tabanus* the large black horse-fly is arranged, and into this genus also several other species of flies are referable. Flies are observed to be very active previous to rain, and during its continuance enter houses in great numbers, proving a source of great trouble and annoyance to the inmates in soiling books, paper, furniture, &c. A variety of methods have been recommended for their dispersion, few of which, however, are of much avail. A mixture of molasses and water in a covered vessel, having a small opening out in the top, is perhaps the best. A solution of corrosive sublimate is also effectual, but its poisonous quality makes it too dangerous to be carelessly exposed.

FLY-CATCHER. The birds which constitute this class have given rise to great difficulties as to their scientific arrangement, not two authors agreeing in their ideas on the subject. They form the genus *Muscicapa* of Brisson and Linnaeus, with the exception of some of the larger species, known by the name of *tyrants*, which the latter placed in his genus *Lanius*. In this he was followed by Gmelin and Latham, who augmented the genus by adding many species. Lacepède divided them into three genera, according to the size of the birds, calling the largest *Tyranni*, the next *Muscivora*, and the smallest *Muscicapa*. Cuvier, in his last edition, forms three subgenera, under the names of *Tyrannus*, *Muscipeta*, and *Muscicapa*, though he also admits several genera and subgenera as appertaining to this class. Temminck divides this great genus into two, *Muscipeta*, nearly resembling Cuvier's subgenus of the same name, and *Muscicapa*. Lastly, Solater restricts the *Muscicapidæ* to a family of which the spotted fly-catcher (*Muscicapa atricapilla*) is the type for one division, while to the other belong the blue fly-catcher (*Myiagra aurea*), the fantail (*Rhipidura*), and the paradise fly-catcher (*Tchitrea paradisæ*), the *Muscipeta* of Cuvier. These birds are widely distributed over the globe, abounding where insects are most numerous, and are of infinite use in destroying those numerous swarms of noxious insects, engendered by heat and moisture, which are continually on the wing. These, though weak and contemptible when individually considered, are formidable by their numbers, devouring the whole produce of vegetation, and inducing the accumulated ill of pestilence and

famine. Fly-catchers perch on branches of trees, &c. whence they watch for insects, and take them on the wing with great quickness. See illustration at Pl. II. ORNITHOLOGY.

FLYING. The power of locomotion through the air is possessed by various animals in different degrees. Birds, bats, and insects can raise themselves into the air and sustain themselves there at will. Squirrels, phalangers, some lizards, one of the tree-frogs, and flying-fish can move through the air in one direction for a short time. The wing of a bird or insect is an elastic flexible organ, with a thick anterior and a thin posterior margin; hence the wing does not act like a solid board, but is thrown into a succession of curves. When a bird rises from the ground it leaps up with head stuck out and expanded tail, so that the body is in the position of a boy's kite when thrown up. The wings are strongly flapped, striking forwards and downwards, and the bird quickly ascends. In continuous flight the body may be inclined, or, as is usual, horizontal: the direction of flight depends on the slope of the wings. If the bird flies level the wing strikes downwards and slightly forwards; if it wishes to rise, the stroke is more decidedly forwards; if to sink, downwards and backward. Pottigrew has shown, and Marey has adopted his view, that the wing describes a figure of 8 in its action, the margin being brought down so that the tip of the wing gives the last blow after the part next the trunk has ceased to strike; hence, standing in front of a bird, the wing would be divided into two, the upper surface of one half and the lower surface of the other being visible at the same time. These portions are reversed when the wing is drawn back and towards the body, before beginning another stroke; but it will be observed that during retraction the wing is still sloped, so that the resemblance to a kite is maintained. Weight is necessary for flight, and in consequence it is found that the area of the wing diminishes as the weight of the bird increases; thus the gnat has eleven times the wing surface of the swallow, reducing both to the same weight. It is difficult to explain the sailing of the albatross for long stretches without apparent motion of the wings. Probably the original impetus is maintained by the kite-like slope of the wing, and advantage may be taken of currents by a rotation of the wing at the shoulder, a movement invisible at any distance. The air cavities in the body and bones of birds may contribute but are not essential to flight; the bat does not possess them; but, as in insects, the function of the extended air surface may be to aerate the blood more rapidly, and thus maintain the prolonged muscular efforts needed. If the extinct Pterodactyles are excepted, all animals other than birds, bats, and insects, which move through the air, as squirrels, flying-dragons, &c., do so as parachutes, going from higher to lower levels, but never rising, nor flying horizontally. The similarity of the movements in flying, swimming, and walking will be discussed under LOCOMOTION (ANIMAL), which see.

FLYING-BRIDGE, a kind of ferry in which the force of the current of a river is applied to propel the boat from the one side to the other. The following is the method by which this is accomplished:—A chain is attached at one end to a buoy fixed in the middle of the river, and at the other to a part of the boat in the line of the keel, and rather nearer the prow than the stern. By means of the helm the prow of the boat is made to point obliquely up the stream, in the direction of the opposite bank, and in such a manner that the keel of the boat forms an obtuse angle with the chain connecting the boat with the buoy. In that position the force of the current, resolved in a direction at right angles to the course

of the river, is sufficient to propel the boat to the opposite side, in the line of an arc of a circle having the buoy for its centre and the chain for its radius. This kind of ferry is often found to be very useful for occasional purposes, as on military expeditions, &c.

FLYING-DRAGON, or **FLYING-LIZARD**. See **DRAGON**.

FLYING-FISH (*Eroctetus*), a fish which is enabled, by the vibration of its large pectoral fins, to leave the water when alarmed or pursued, and sustain itself for several seconds in the air. In tropical seas the flying-fish rise from the water in flocks, or, more properly, shoals, of many thousands at a time, when disturbed by the passing of a ship, or pursued by their inveterate foes, the dolphin and albacore. They spring from the crest of a wave, and, darting forward, plunge into another to wet the membrane of the fins, and in this manner continue their flights for several hundred yards, often pursued by marine birds in the element to which they are driven for protection against the tyrants of their own. In all the species belonging to the genus *Eroctetus*, which is referred to the Scomberesocidae or garfishes, the pectoral fins are very much developed, and the superior lobe of the caudal fin shorter; the head and body are invested with large soft scales, and the body has a ridge or carina extending longitudinally along each flank, which gives it somewhat of an angular appearance. Head, when viewed from the front, triangular; eyes very large; teeth minute, sometimes absent; branchiostegous rays ten; air-bladder very large. Flying-fish are inhabitants of every temperate sea, though abounding in the vicinity of the equator. In length they rarely exceed 13 inches, and are commonly found about 8. The flesh is pleasant, and much resembles that of the fresh-water gudgeon. Several species are described by naturalists, some of which have very long fleshy filaments depending from the lower jaw, the use of which is not known. The *Eroctetus voltans*, or common flying-fish of the Atlantic, bears some resemblance to the *E. exilis*, which is found in the Mediterranean, but differs in having small ventral fins inserted behind the centre of the body. The rapidity and force with which these fish move through the air by the aid of their pectoral fins are such, that, in coming on board ships, they are generally killed by the violence with which they strike, and in some cases the head is fractured and beaten to pieces. Several species have appendages or filaments attached to the lower jaw, as we have observed above; but it is noteworthy that these occur only in small individuals, and the appendages are therefore perhaps only possessed by the young of species which are destitute of barbels. Among these is the *Eroctetus appendiculatus*, a very rare species, few specimens of which exist in collections (Pl. CHIL.—CIV. fig. 18).

FLYING-LEMUR, or **FLYING-POX**. See **LEMUR**.

FLYING-SQUIRREL. See **SQUIRREL**.

FLY-TRAP. See **DIONEA MUSCIPULA**.

FLY-WHEEL, a heavy disc or hoop balanced on its axis of motion and at right angles to it, attached to machines to regulate their motions. The use of the fly-wheel may be illustrated by the case of the ordinary beam-engine, in which one end of the beam is attached to the piston-rod, and the other end to a rod connecting it with a crank fixed to the axle of a fly-wheel. As the beam oscillates vertically on its centre it is clear that when the piston-rod is at its highest the crank must be at its lowest, and in a line with the rod connecting it with the one end of the beam. In these circumstances any force applied to push the piston downwards would be resisted longitudinally by the connecting-rod, and no motion would ensue; but the momentum of the fly-wheel, resulting

from the motion previously communicated to it, carries the crank beyond this position, and allows the piston again to be pushed down. The effect of the fly-wheel is thus to equalize the motion of the whole engine.

FO, the Chinese name of Buddha. See **BUDHA**. **FOCHABERS**, a village in Scotland, in the county of Moray, on a height above the right bank of the Spey, 8 miles south-east of Elgin. At the east end of the village is a fine building known as Milne's Free School, built and partly supported by funds (amounting to £20,000) bequeathed by Alexander Milne, a native of the place, who made a large fortune as a merchant in New Orleans. The splendid mansion of Gordon Castle (Duke of Richmond and Gordon) is in the vicinity. Pop. (1891), 1101.

FOCUS, in optics, is a point wherein several rays concur or are collected after having undergone either refraction or reflection. This point is thus denominated, because the rays being here brought together and united, their joint effect is sufficient to burn bodies exposed to their action; and hence this point is called the *focus* or burning-point. It must be observed, however, that the focus is not, strictly speaking, a point, for the rays are not accurately collected into one and the same place or point, owing to the different nature and refrangibility of the rays of light, to the imperfections in the figure of the lens and other similar impediments. The focus, therefore, is a small circle, which Huyghens has demonstrated to be one-eighth the thickness of the lens when it is convex on both sides; that is, it cannot be less than this, but in imperfect glasses it exceeds the above measure sometimes considerably.

FETUS, in anatomy, a term applied to the offspring of the human subject, or of other mammals, during its residence in the womb. See **EMBRYO**.

FOG. There is a constant ascent of watery particles from the surface of the earth, occasioned by the evaporation from masses of water and moist bodies. Part of the water which rises in vapour is intimately united with the atmospheric air, which holds it in solution. This portion of aqueous matter is invisible, and exists in the greatest quantity in very warm and serene weather. Thus, in the hot days of summer, any cold body (as a vessel filled with cold water) is immediately covered with little globules of water, which are the vapour of the atmosphere precipitated. But when the air is saturated the watery particles which continue to rise are no longer dissolved, but remain suspended in vesicular vapours, which form clouds (which see) when they rise to a great height, and fogs when they hover near the surface of the earth. Fogs are more frequent in those seasons of the year when there is a considerable difference of temperature in the different parts of the day; as, for instance, in autumn, when, in the warmest part of the day, the air is capable of holding a great quantity of aqueous matter in solution, which on cooling, towards evening, it is no longer capable of dissolving. In hot weather the air is not so easily saturated, and in cold weather the process of evaporation is very slow, so that in these cases fogs are less common. In low, moist places, and in confined places, as valleys, forests, bays, or lakes, surrounded by high lands, they are much more prevalent than in open countries or elevated spots, where they are quickly dispersed by the winds. There is another atmospheric phenomenon, which has been called *dry fogs*. These seem to originate by the condensation, from non-saturated air, of moisture upon fine dust particles floating in the air, and this would account for the extremely dense fogs common in large towns. It is also maintained that ordinary fogs arise through the condensation of moisture upon fine invisible particles floating in the air.

FOGGIA, or **CAPITANATA**, a province of Southern Italy, on the Adriatic, between the provinces of Campobasso and Bari. It possesses rich pastures. Among its special products are wines, saffron, and fruita. The principal town is Foggia. Area, 2688 square miles. Pop. (1898), 419,535.

FOGGIA, a walled town of South Italy, province of Foggia or Capitanata, in the centre of the Apulian Plain, 79 miles N.E. of Naples. It consists of regular and spacious streets, often lined with handsome mansions, in which the provincial nobility reside. Its principal edifices are a Gothic cathedral, several other churches and convents, a governor's palace, a custom-house, a theatre, a grammar and other schools. The trade is chiefly in corn, for which immense granaries have been formed under the streets, and in wool, cattle, wine, and capers. The annual fair is very important. Pop. in 1901, 53,351.

FOG-SIGNALS, signals given by means of sound to warn vessels of the neighbourhood of danger during fog, when lights or other visible signals cannot be perceived. Various kinds of fog-signals are used, among which may be mentioned bells, drums, gongs, guns, compressed-air whistles, steam-whistles, and fog trumpets or horns. Gongs are not very powerful as signals, often failing to be heard at more than the distance of a quarter of a mile. Bells may be heard during fog at a distance of from 1 to 3 miles. Guns have been heard as far as 10 miles, with a light breeze blowing across the sound. One of the most powerful signals is the siren fog-horn, the sound of which is produced by means of a disc perforated by radial slits made to rotate in front of a fixed disc exactly similar, while a long iron trumpet forms part of the apparatus. The disc is made to revolve rapidly, and when the slits are opposite each other openings are formed through which steam or compressed air is forced. This causes a sound of very great power, which the trumpet collects and compresses, and which under favourable circumstances is heard from 20 to 30 miles out at sea. Fog-signals are also used on railways during foggy weather. They consist of cases filled with detonating powder, which are laid on the rails and exploded by the engine when it comes up to them.

FOIL, a thin leaf of metal, placed under transparent substances, such as precious stones, for the sake of improving their colour and heightening their lustre, the light which passes through the transparent body being reflected by the metal. Foil, in fencing, a blunt sword, or one tipped with a button or cork, covered with leather.

FOIX, a town of France, capital of the department Ariège, beautifully situated across the mouth of a valley, between lofty precipices, at the junction of the Arget with the Ariège, here crossed by a bridge. The most interesting objects are the old castle, a handsome parish church, the abbey of St. Volusien, the communal college, and barracks. The chief manufactures are articles in iron and steel, and the trade is in these, and in cattle, wool, leather, pitch, turpentine, &c. Pop. (1891) 6177.

FOIX, GASTON DE. See **GASTON**.

FOKJEN, a province of China, bounded N. by Che-kiang, N.W. and W. by Kiang-see, S. by Quantong, and S.E. and E. by the China Sea; area, 83,600 square miles. The coast is deeply indented by bays and studded with islands, including Amoy, Hai-tan, and others. The island of Formosa formerly belonged to the province. The interior is generally mountainous; but by cultivating not only the plains and slopes, but terracing the hill-sides, often to their summits, the far greater part of the surface is turned to good account. The higher mountains are covered with trees, and the cultivated terraces sometimes number

thirty to forty. The Min and its tributaries are the most important rivers. The principal products are rice, wheat, barley, tea of superior quality, silk, sugar, indigo, camphor, and tobacco. The minerals include iron and alum, which, with porcelain, various tissues, and the above products, are the chief exports. The capital is Foo-choo-foo. Amoy and other important commercial towns are also included in the province. Pop. 25,790,556.

FOKSCHANI, a town of Roumania, in Moldavia, on the frontiers of Walachia, on the Milkov, 92 miles N.E. Bucharest. It has several Greek churches, also Roman Catholic and Armenian churches, two Jewish synagogues, a lyceum, &c. There is a large trade, especially in grain. In 1789 it was devastated by the Russians, and, after being rebuilt, it was in 1822 burned by the Turks. Pop. (1899), 23,783.

FOLO-LAND (that is, *folk-land*), a name among the Anglo-Saxons for public land, in opposition to *boc-land* (book-land), or land held by a charter or deed. Folo-land was the property of the people, and while it continued to be held by this tenure it could not be alienated. It was sometimes, however, parcelled out for a term to individuals, on the expiration of which it reverted to the community. Its proprietors were liable to the charges of public works, hospitality, and other common duties of the district, from which *boc-land* was free. Folo-land might be held by freemen of any rank, but was not devisable by will, unless it was converted into *boc-land*, which could be done by the sovereign. Folo-land seems to have been assigned as a reward for military services.

FÖLDVÁR (*Duna*), a town of the Austro-Hungarian Empire, Hungary, county Tolna, pleasantly situated, partly on the summit and partly on the side of a hill above the right bank of the Danube, 17 miles E.N.E. of Simontornya. Only some remains of its once strong fortifications now exist. It has a Roman Catholic and a Greek Non-united church, a Franciscan monastery, high school, barracks, and a valuable sturgeon fishery. Pop. (1900), 12,117.

FOLEY, **JOHN HENRY**, R.A., an eminent British sculptor, was born at Dublin, 24th May, 1818. At the age of thirteen he became a student of the Dublin Royal Society of Art, where he obtained the first prizes in the schools for the study of the human form, animals, architecture, and modelling. In 1834 he went to London to study sculpture in the Royal Academy. In 1839 he first appeared as an exhibitor in the Academy with models of Innocence and The Death of Abel. In 1840 he produced *Ino and Bacchus*, a marble group, which enhanced the reputation already made by his previous works. Among the works exhibited at the Academy or elsewhere in following years were *Lear and Cordelia*, and *The Death of Lear* (1841); *Venus rescuing Æneas*, and *The Houseless Wanderer* (1842); *Prospero relating his Adventures to Miranda* (1843); *A Youth at a Stream* (1844); *Contemplation* (1845). He was one of three artists selected to execute statues for the new palace of Westminster, for which he prepared *Hampden* (1847) and *Selden* (1853). In 1848 he produced *Innocence*; in 1849 *The Mourner*. In 1849 he became A.R.A., and in 1851 he exhibited *The Mother*. He executed a monumental composition for Milford Church, Hants, to the memory of Admiral Cornwallis and Captain Whitby, one of the figures of which, *Grief*, was exhibited at the Academy in 1852. In 1854 he exhibited *Egeria*—a commission for the Mansion House by the corporation of London. In 1856 he completed a bronze equestrian statue of Lord Hardinge for Calcutta. He received a requisition to execute a replica of this work for London, but funds fell short for the purpose. In 1858 he modelled *Caractacus* for the Mansion

House, and the same year he was elected R.A. For his diploma work he selected a subject from Comus. Among his other works are Oliver Goldsmith, and Edmund Burke, for Dublin; Lord Clive, for Shrewsbury; Sir Charles Barry, and Lord Herbert, for the war-office; Father Mathew, for Cork; Lord Elphinstone, and a Parsee dignitary, for Bombay; General Outram, for Waterloo Place, London; and Lord Clyde, for Glasgow. He also executed the group Asia, and the colossal statue of Prince Albert for the Albert Memorial. The labour and anxiety connected with this work, which had at first been intrusted to Baron Marochetti, affected the health of the sculptor, and after a short illness he died 27th August, 1874.

FOLIGNO (anc. *Fulginium*), a town of Italy, in the province of Perugia, 20 miles S.E. of Perugia, in a beautiful vale winding among the Apennines, 40 miles in length by about 10 in width, watered by the Clitumnus. The only public buildings worthy of notice are the cathedral and the Palazzo Comunale. Manufactures—woolens, parchment, wax candles, soap, and playing cards; there are also silk-mills and tanneries, and it has some trade in cattle. It was anciently a place of some importance, being at the head of a confederacy of Umbrian cities. In 1439 it was incorporated with the States of the Church by Cardinal Vitelleschi, on the extinction of the Fiacchi family. Pop. in 1881, 8753.

FOLKESTONE, a seaport, England, county Kent, 6 miles W. by S. of Dover, and 69 miles by rail S.E. of London, partly on the shore, but principally on a cliff overlooking the sea. It has suffered much from encroachments of the sea, which is said to have swept away four out of its five churches. The remaining one, crowning the summit of the height, and surmounted by a tower rising from its centre, is the most conspicuous edifice. Other churches have been built in more recent times. There is a town-hall, a grammar-school, a technical school, a free library, hospital, convalescent home, promenade pier, &c. Folkestone was a Roman station, and under the Saxons rose to some importance. Its prosperity, which had latterly declined, was revived by its being made a terminus of the South-Eastern Railway and a chief station for steamers to Boulogne. Its shipping trade and fisheries are of importance. It is also a favourite watering-place. Folkestone is included in the parl. borough of Hythe. Pop. in 1881, 18,822; in 1891, 23,711; in 1901, 30,694.

FOLK-LORE, a useful term of recent introduction into the English language, and, from the great variety of matters to which it is applied, somewhat difficult of definition. It includes all popular superstitions and superstitious observances whatever they relate to, as to births, marriage, diseases, death, burial; all popular sayings and beliefs relating to the weather, the influence of the moon, &c., beliefs which are sometimes founded on observation, but which are fully as frequently unfounded and erroneous; all traditional mythology and beliefs in supernatural beings and agencies; ceremonies observed at popular festivals, as Hallowe'en or May-day; ancient songs and ballads, popular rhymes, nursery tales, &c. Folk-lore, though it takes cognizance of many apparently trivial matters, is of great importance in the science of comparative mythology, and helps to throw much light on the relationships between races, and on the origin and development of religious beliefs and ceremonies. It is, therefore, of great assistance to the ethnologist, the sociologist, and the historian, as well as to the student of comparative mythology and of the science of religion. It has attracted much attention in recent times, and in Germany has been studied with scientific method by the brothers Grimm, Felix Liebrecht, and others. Among English books on the subject

we may mention Sir Thomas Browne's *Pseudodoxia Epidemica* (1646), Aubrey's *Miscellanies* (1696), Brand's *Popular Antiquities*; Hone's *Every-day Book*, *Year Book*, and *Table Book*; Chambers' *Book of Days*; Andrew Lang's *Custom and Myth*, &c.

FONBLANQUE, ALBANY WILLIAM, English journalist, was born in 1797. He was educated for the bar, but developing a taste for political discussion, he was first engaged in the *Morning Chronicle*, and afterwards in the *Examiner*, of which he became the proprietor, editor, and leading writer. A reprint of many of his articles, under the title, *England under Seven Administrations*, appeared in 1837. In reward of his advocacy of Liberal principles Lord John Russell appointed him chief of the statistical department of the Board of Trade in 1852. He still continued to be an occasional contributor to the *Examiner*, but from this period his active connection with journalism all but ceased. He died 14th October, 1872.

FOND DU LAC, a city of the United States, capital of Fond du Lac county, Wisconsin, at the mouth of Fond du Lac River, which opens on Lake Winnebago, 148 miles N.N.W. of Chicago, with which it is connected by rail. It is the centre of several railways, and steamers ply regularly between the lake ports. The manufactures include iron-founding, carriage and waggon making, tanning, saw milling, &c., and there is a considerable shipping trade in wood, hay, and cattle. Pop. (1890), 12,024.

FONDI, the ancient *Fundi*, a town of Italy, Naples, in the province Terra di Lavoro, near a lake to which it gives name; 40 miles W. Capua, on the Appian Way, which here is still in good condition. It is a bishop's see, and contains a cathedral. At the extremity of the town is an old castle, of no great strength. Fondi stands in a plain, surrounded on one side with hills, whence it looks like an amphitheatre. Most of these hills are covered with olive-trees, and the whole plain is interspersed with orange, lemon, and other fruit-trees, whose verdure forms a perpetual spring. The Lake of Fondi (anciently *Lacus Fundanus* or *Amydanus*) lies between the road and the sea; it sends forth noxious exhalations. Pop. 4937.

FONT, in church architecture, the vessel which contains the water for baptism. It is frequently sculptured in stone or marble, with richly decorative designs. The form of font with which we are now familiar seems to have been introduced in mediæval churches. In the early Latin Church, from the time of Constantine, baptism was administered in baptisteries, which were buildings separate from but adjoining the church. (See BAPTISTERY.) When baptism by sprinkling had superseded baptism by immersion, separate baptisteries gradually fell into desuetude, and the baptismal font assumed its modern form.

FONTAINE, JEAN DE LA. See LA FONTAINE (JEAN DE).

FONTAINEBLEAU, a town of France, in the department of Seine-et-Marne, and in the midst of the forest of same name, about 2 miles from the left bank of the Seine, and 37 miles S.W. Paris. It is well built, partly of stone and partly of brick, with spacious and regular streets; is the seat of a court of first resort, and several public offices; contains fine barracks, a communal college, school of design, public library of 28,000 volumes, public baths, and several hospitals; and has manufactures of calico, porcelain, and stoneware; quarries of sandstone, extensively used in paving the streets of Paris and the roads of the surrounding districts; and a trade in wine, fruit, preserves, cattle, &c. Pop. (1891), 14,078. The castle or palace of Fontainebleau, from which the town derives its chief importance, is one of the most magnificent in France. Many of its sovereigns have made it their favourite residence,

and vied with each other in lavishing upon it all the embellishments that art could furnish, without any limitation as to expense. Henri IV., Louis XIV., Napoleon I., Louis Philippe, and Napoleon III. all expended large sums upon it. It is now a summer residence of the president of the republic. The park, laid out like a vast garden, and adorned with statues, temples, fountains, lakes, and waterfalls, corresponds to the magnificence of the palace. The forest, which has an area of 70 square miles, abounds with all kinds of game. Fontainebleau was a royal residence in the twelfth century. The château was begun by Francis I., and he received the Emperor Charles V. in it in 1539. It was the residence of Ex-queen Christina of Sweden in 1654, and Napoleon I. signed his abdication here 4th April, 1814.

FONTANA, DOMENICO, an Italian architect of the sixteenth century, born at Mili, a village on the Lake of Como, in 1543. He pursued the study of geometry in his youth, and at the age of twenty went to Rome, where he studied the remains of ancient and the master-pieces of modern art. Cardinal Montalto (afterwards Pope Sixtus V.) engaged him in his service as an architect, and employed him to construct a chapel in the church of St. Maria-Maggiore, and a palace in the garden of the same church. Montalto, like other Italian prelates and princes, was ambitious of attaching his name to some imposing works, and directed Fontana to spare no expense. But the pecuniary resources of the cardinal failed, and the undertaking would have been interrupted had not Fontana himself supplied the means for continuing the work. Montalto was not unmindful of this liberality; being soon after raised to the Papal chair, he confirmed Fontana in his office of architect, and employed him in building another palace near the baths of Diocletian. Sixtus V. wished to remove the great obelisk, now in front of St. Peter's church, which was then nearly buried under the rubbish, to the middle of the square. This undertaking had been already contemplated by several popes, but had been relinquished on account of the difficulty of accomplishing it. Fontana happily executed this gigantic operation in the year 1586. He afterwards erected three other obelisks, which were found, partly buried under ruins, in different squares. Among other buildings erected by Fontana, by the command of Sixtus V., and which are an honour to the patron not less than to the architect, the library of the Vatican, and the aqueduct (*acqua felice*), deserve particular mention. Under Clement VIII. Fontana also constructed several buildings, and repaired ancient monuments. Having been accused of converting to his private use the money received for public purposes, he was deprived of his office by the pope, but immediately received the offer of the post of architect and chief engineer of the King of the Two Sicilies, and, in 1592, went to Naples. He there constructed several canals to prevent inundations, a new road along the bay, and the royal palace in the capital, which, however, has been since considerably changed. His plan for a harbour at Naples was executed after his death by another architect. Fontana died at Naples in 1607, and was succeeded in the office of royal architect by his son Julius Caesar. We have but one literary work by Domenico Fontana (Rome, 1590, with nineteen engravings). It is an explanation of his method of removing the great obelisk. The process must be considered as his own invention, since the writings of former architects contain no rules on this subject.

FONTANA, FELICE, natural philosopher at the grand-ducal court of Florence, was born at Pomarolo, not far from Roveredo, in the Italian Tyrol, in 1730; began his studies in the schools at Roveredo

and Verona, and, after having completed them at the universities of Padua and Bologna, went to Rome, and thence to Florence. The Grand-duke Francis (afterwards emperor) appointed him professor of natural philosophy in the University of Pisa. The Grand-duke Leopold (afterwards Emperor Leopold II.) invited him to Florence, but permitted him to retain his office at Pisa, and employed him in forming the cabinet of the natural sciences, which is yet one of the ornaments of Florence. This collection contains an immense number of anatomical preparations in coloured wax, which exhibit all parts of the human body in the minutest detail, and in all imaginable positions. They are executed with the greatest skill, and were made by different artists under the direction of Fontana. The Emperor Joseph II. procured from him a similar collection for the surgical academy in Vienna. In the same way many plants, and other natural objects, which lose their natural colours by keeping, were represented in coloured wax from nature, under his direction. Fontana is the author of several works on scientific subjects, some of which have been translated into German and French. He also made several discoveries relative to the application of carbonic acid, and different sorts of gas. His writings show him to have been an ingenious and indefatigable observer. The political principles which he avowed during the events of 1799 in Tuscany involved him in some difficulties. He died in 1805, and was buried in the church of Santa Croce by the side of Galileo and Viviani.

FONTARABIA. See FUENTERRABIA.

FONTENAY-SOUS-FOURONNES, a village of France, department of the Yonne, where a bloody battle was fought between the sons of Louis le Débonnaire in 841, the consequence of which was the division (843) of the Frankish Empire, founded by Charlemagne. Lothaire I. received Italy, and what was afterwards called *Lorraine*, with the title of emperor; Louis received Germany, and Charles the Bald France. There are many other places of this name in France, some of which are distinguished from each other by some particular epithet.

FONTENELLE, BERNARD LE BOVIER DE, born at Rouen, 1657; son of an advocate and of a sister of the great Corneille. Although he lived to the age of nearly 100 years, and retained, till his death in 1757, a remarkable degree of activity, preserving a sound mind in a sound body, he came into the world so weak that it was not thought possible that he could survive. He began his youthful studies in the college of the Jesuits at Rouen, and at the age of thirteen entered the class of rhetoric. After completing his studies he was admitted an advocate, conducted a cause, which he lost, and renounced the bar for ever. In 1674 he went to Paris, and soon became known by his poetical effusions and learned works. Several of his poems appeared in the *Mercure galant*, and displayed much poetic sensibility and taste. Before the age of twenty he had assisted in the composition of the operas of *Psyche* and *Bellerophon*, which appeared under the name of his uncle, Thomas Corneille. In 1681 he brought out his tragedy *Aspar*, which was unsuccessful. Its failure excited so much attention that Racine wrote an epigram on it. Zeal for the fame of his uncle, and personal feeling, brought him into a party entirely opposed to the opinions of those who then directed the destinies of French literature. But his amiable character and his love of peace prevented him from entering into the contest with acrimony. In the dispute concerning the comparative merit of the ancients and moderns he favoured the opponents of antiquity. He became acquainted in his youth with the philosophy of Des-

cartes, and remained attached to it without being willing to defend it. In 1688 appeared his *Dialogues of the Dead*, which were favourably received, although his continual straining after wit and novelty deprives them of the charm of natural ease. His *Entretiens sur la Pluralité des Mondes* (1686) was the first book in which astronomical subjects were discussed with taste and wit. It has now become obsolete, in consequence of the advancement of science. Fontenelle distinguished himself as secretary of the Academy of Science by his *Éloges*—a class of writings which have become so common since his time.

FONTENOY, a village in the Netherlands, province of Hainaut, celebrated for the battle of May 11, 1745, in which the French, under Marshal Saxe, defeated the British, Austrian, and Dutch allied forces under the Duke of Cumberland.

Fontevrault, a commune of France, in the department of Maine-et-Loire, with 3581 inhabitants, situated in the middle of a forest occupying a valley in which flows a perennial fountain, 10 miles south-east of Saumur. This valley is celebrated as the site of the rich Benedictine abbey founded by Robert d'Arbrissel in 1099. This abbey, containing both monks and nuns, was always, after the death of Robert, governed by an abbess. The title of the Abbess of Fontevrault was 'Abbesse, chef et general.' She was abbess of the Benedictine nuns, and chief and general of the Benedictine monks. According to Jal this form of government dates from the twelfth century. Robert founded three monasteries under the same roof—one, Le Grand Moutier, for widows and virgins; another, Le Saint Lazare, for lepers; a third, La Magdelaine, for fallen women. The men occupied a special locality. They cultivated the land and provided for the wants of the community, while the women prayed and sang praises to God. The order was under the rule of St. Benedict. The superiority of the female sex was adopted in honour of the mother of Christ. This abbey became the head of an order, and had many dependencies. There were thirty in Brittany alone, and the number of nuns belonging to the order was estimated in 1145 at 5000. It had declined to 700 in 1248, and to 500 in 1360. The order was reformed in 1475 by the twenty-sixth abbess, Marie of Bretagne, and the severity of her rule was maintained by Anne of Orleans, sister of Louis XII., Renée of Bourbon, and Jeanne-Baptiste of Bourbon, daughter of Henry IV. The last abbess, in 1789, was Madame d'Antin, niece of Madame de Montespan. The abbesses of Fontevrault always belonged to the highest families. In the abbey of Fontevrault are the tombs of Henry II. and of Richard I., kings of England and counts of Anjou, and of Eleanor, wife of Henry II., and Elizabeth, wife of John, king of England.

FOO-CHOW, a town, China, capital of the province of Fokien, in a plain surrounded by an amphitheatre of hills, on the left bank of the Min, 125 miles n.e. of Amoy. It consists of the town proper, surrounded by walls, and of extensive suburbs, which, stretching along both sides of the river, communicate by a stone bridge. The walls, 30 feet high and 12 feet wide at top, are overgrown with grass, and the gates, seven in number, are overlooked by high towers. The streets are extremely dirty, and the lines of shops, crowded with goods or with workmen in the act of making them, make the whole place look like one vast series of market-stalls. The principal edifices are the Ching-hwang Miao, and several other temples. Foo-chow is one of the five ports thrown open by the Treaty of 1843. The trade is very extensive, but the navigation of the river from the sea to the harbour is difficult. Principal exports—timber, bamboo, fruits, tobacco, potash,

paper, and especially for the foreign trade—tea. Of this last commodity there were exported 41,832,896 lbs. in 1898, of the value of £970,974, two-thirds of it to Britain. The imports in 1898 were of the total value of £1,069,048. The principal import is opium, which in the above year was of the value of £287,221; other imports are lead, cottons, woollens. Pop. 650,000.

FOOD. See **ALIMENT** and **DIETETICA**.

FOOL. See **JESTER**.

FOOLS, FEAST OF. Festivals, under this name, were regularly celebrated, from the fifth to the sixteenth century, in several countries of Europe, by the clergy and laity, with the most absurd ceremonies, and form one of the strangest phenomena in the history of mankind. Among the heathen festivals which the Christians could not easily abolish, were the Saturnalia, which, in the confusion of all distinctions of ranks, and in extravagance of merriment, exceeded the gayest carnivals. The feast of *fête*, among Christians, was an imitation of the Saturnalia, and, like this, was celebrated in December. The chief celebration fell upon the day of the Innocents, or upon New-year's Day; but the feast continued from Christmas to the last Sunday of Epiphany. At first only the boys of the choir and young sacristans played the principal part in them; but afterwards all the inferior servants of the church, and even laymen, engaged in them, whilst the bishop, or the highest clergyman of the place, with the canons, formed the audience. The young people, who played the chief parts, chose from among their own number a *bishop* or *archbishop of fools*, or of *unreason*, as he was called, and consecrated him, with many ridiculous ceremonies, in the chief church of the place. This officer then took the usual seat of the bishop, and caused high mass to be said, unless he preferred to read it himself, and to give his blessing to the people, which was done with the most ridiculous ceremonies. During this time the rest of the performers, dressed in different kinds of masks and disguises, engaged in indecent songs and dances, and practised all possible follies in the church. Except from their association with the Saturnalia nothing is known of the origin of these extravagancies, which appear to have been very ancient. The most celebrated, and probably one of the most ancient of these festivals, was held in the city of Sens, in France. By an ordinance in 1245, intended to abolish it, it is alluded to as a very ancient celebration. So general was the custom of these celebrations in France, that it is said there were few towns at the end of the seventeenth, or even as late as the middle of the eighteenth century, in which associations did not exist with the titles of *Cours des Fous* or *Cours des Sots*. Similar antics seem to have been played in other countries, as Germany, England, and Scotland, but it is to be hoped that the height of profanity reached in some of the extant liturgies and rubrics was not commonly attained in these fooleries. The *fête des fous* at Sens was suppressed in 1547. A minute history of it has been written by Aimé d'Hérest. These fêtes were frequently prohibited, but until the Reformation period, when they were considered dangerous by the ecclesiastical authorities, they were commonly tolerated. Sir Walter Scott says that the general title of the leader of the fantastic ceremonies was in Scotland the Abbot of Unreason, and in England the Lord of Misrule. In France the *fête des fous* was frequently called the *fête des innocents*, or *fête de l'âne*. There were other celebrations by the same associations at other periods of the year. To account for these celebrations, so opposed to all our ideas of religion, decency, and common sense, we must transfer ourselves to

times when men combined, with childish simplicity, the most ridiculous with the noblest subjects, and often with less injury than we should suppose to the latter. Similarly, grotesque or indecent figures are to be seen among the sculptures of old Gothic churches, and may not unfrequently be detected in the work of the large initial letters of the breviaries and religious books of this period.

FOOT, a measure of length, the name of which is derived from the length of the human foot, containing 12 linear inches.—*Square foot* is a square whose side is one foot, and is therefore equal to 144 square inches.—*Cubic foot* is a cube whose side is 1 foot, and the cube contains 1728 cubic inches. The foot is a common measure in various countries, but its dimensions vary somewhat.

FOOT, in prosody, a measure consisting of a variety of syllables, two, three, or four, in combinations of long and short, or accented and unaccented. The number of possible varieties of feet is reckoned at twenty-eight. See **RYTHM**.

FOOT, HUMAN. The foot of man, specially designed for the support of the body, is not an organ of prehension, and cannot, like the foot of the monkey, take hold of objects by opposing the thumb to the other fingers; the toes, disposed upon the same plane, have neither the length of the fingers nor the extent and variety of their movements; in a word, it is a foot, and not, as in the quadrumana, a hand. The foot is composed of twenty-six bones, seven of which constitute the tarsus, which articulates with the leg and corresponds to the carpus (wrist). Five bones form the metatarsus, which corresponds to the metacarpus, and articulates with the tarsus behind, and with the toes in front. The foot is narrow and thick in its posterior part, thinner and broader anteriorly; it forms a right angle with the leg, and rests upon the ground at the extremities only. The middle portion is in the form of an arch, and, in consequence, resists shocks and supports pressure much better than it could if it were flat, and touched the ground throughout its whole length. And although the parts are very firmly united together there is sufficient mobility to give great elasticity to the whole, and this elasticity is augmented by the toes. The foot thus supports the weight of the body like an arch and spring combined, giving it in this way great advantage in resistance. See plate at **ANATOMY**.

FOOTA-JALLON, a region of West Africa, in Senegambia, intersected by lat. 11° N. and lon. 11° W. It is extremely mountainous, and remarkable for the romantic beauty of its scenery; and is the source of the rivers Senegal, Gambi, &c. Large herds and flocks are pastured; and the soil produces in abundance bananas and other fruits, besides numerous palm-trees, which furnish dates, wine, and oil. The inhabitants are fanatical Mohammedans. They are governed by an elective chief under French protection. The capital is Timbo. Pop. 600,000.

FOOT-AND MOUTH DISEASE, a disease to which cattle are subject, and which is included among those that are provided against by the Contagious Diseases (Animals) Acts (which see). It is an exanthematous affection which attacks the feet and mouths of cattle, manifesting itself by lameness, indisposition to eat, and general febrile symptoms, with ultimately eruptions of small vesicles on the parts affected, and general indisposition of the animal. The disease occasionally spreads to the udders of milch-cows. Its scientific name is *Exsima epistocia*, and it is very contagious, being propagated by the saliva from the mouth, or by the matter from the foot of a diseased animal. It is thus easily spread among cattle drinking at the same watering-place or using the same road or yard.

FOOTBALL, an outdoor game much practised by young men and lads in the United Kingdom and elsewhere. Football is a game of great antiquity. Edward III. prohibited football in 1349 as one of the games likely to interfere with archery. In Scotland and the north of England the public celebration of football games on Shrove Tuesday seems to have been a custom going back to an unknown period. In England, Derby was particularly famous for the Shrove Tuesday games. There were goals as in the modern game, but in these ancient celebrations the modern rules of play seem to have been entirely unknown, or honoured rather in the breach than the observance. The married women in Midlothian used to play annually against the single, and are said to have been generally victorious. On the Borders these games were carried on between the English and Scotch with a fierceness that partook of national rivalry, and the recollection of more serious conflicts. Most of these annual celebrations have long fallen into disuse, and the game has only again acquired great popularity in recent times. Modern football in Britain is regulated by definite laws administered by recognized bodies.

The two most popular, and indeed the only, sets of rules now in use are the Rugby rules and the rules of the Football Association. In the latter game there are eleven players on each side, whilst in the former there are fifteen. The men are arranged on the field in a definite manner in each game. In the Association game a side is constituted thus: goalkeeper; two backs (left and right); three half-backs (left, centre, and right); five forwards, namely, two on the left wing (outside left and inside left), a centre forward, and two on the right wing (outside right and inside right). In Rugby football the arrangement is: one full back; three three-quarter backs; two half-backs; nine forwards. Speaking generally, the goalkeeper and backs in the Association game have to defend their own goal, whilst the duty of the forwards is to attack their opponents' goal. The half-backs combine attack with defence. They feed their forwards with the ball, and may on occasion play a forward game, but at other times they have to support their own backs in the defence. The position of centre-half-back is a peculiarly difficult one. Speed and accurate dribbling and shooting are required in forwards; strong kicking and sound judgment in backs. In the Rugby game the ball must, to gain a goal, be kicked over a bar 10 feet high, in the Association game under a bar not more than 8 feet high. The game is played with a ball made of an ox-bladder, or now more commonly of an india-rubber bladder, covered with strong leather. In both the common forms of the game each side is commanded by a captain. The goals, through or over which it is the object of the players to drive the ball, are formed by posts, two of which are placed at each end of the field, each pair being equidistant from a central point. The area on which the game is played is defined by lines joining the goal-posts at either end and prolonged a certain distance right and left (goal-lines), and by two parallel lateral lines which are supposed to run, or are indicated by flags, from the one goal line to the other (touch-lines). The ball of course is often sent outside of these lines; it is then sent back by a kick or flung back, according to the game. The line between the posts forming the goal by the Rugby rules must be 18 feet 6 inches in length; by the Association rules it is 8 yards. Each goal is in possession of a keeper, and the rest of the party are distributed over the field in the manner prescribed by the rules. The Rugby game is much rougher and less scientific than the Association game, which dis-

courages rough play and relies mainly on the skilful manœuvring of the ball with the feet, it being forbidden (except to the goalkeeper) to touch the ball with the hands. By the Rugby rules the player may catch and run with it and kick it dropping or touch it down behind the opposite party's goal-line. A game of football usually lasts about ninety minutes, and at half-time the players change ends. The party winning most goals are the victors in Association football; but in the Rugby game there are several kinds of goals, and the result goes by points. For many years international matches have been a regular feature of the game. The leading countries in the Association game are Scotland and England, and the annual struggles between them are witnessed by enormous crowds. Ireland and Wales hold a more respectable place in the annals of the Rugby game than in those of the Association game.

FOOTE, SAMUEL, a comic writer and actor, was born about 1720, at Truro, in Cornwall. He was educated at Worcester College, Oxford, and entered the Temple; but after a course of dissipation, to which his small fortune fell a sacrifice, he turned his attention to the stage. He appeared first in Othello, but had little success as a tragedian, and soon struck out an untrodden path for himself in his double character of author and performer. In 1747 he opened the little theatre in Haymarket, with a dramatic piece, which he entitled the Divisions of the Morning. It consisted of some very humorous imitations of well-known characters, in detached scenes, written by Foote, who always took the leading parts himself. It succeeded so well, that, in order to avoid the act for limiting the number of theatres, he repeated it under the title of Mr. Foote's giving Tea to his Friends. After 1752 he performed alternately in London and Dublin. He did not obtain a patent for the Haymarket till 1766, when, riding out with the Duke of York, he fell from his horse and broke his leg. In compensation for the accident the duke procured the patent for him. He died at Dover, October, 1777. Of his numerous plays, above twenty in number, hardly one is now acted. His humour appears to have been a personal gift, and is described by Dr. Johnson and other witnesses as irresistible.

FOOT-GUARDS. See GUARDS.

FOOT-POUND. The English engineer's unit quantity of work is the work of raising 1 lb. to a height of 1 foot, and it is called a foot-pound of work. A man is capable of doing about 1,000,000 foot-pounds of work in a day. See FORCE (ANIMAL).

FORAGE, in military affairs, denotes the provisions brought into the camp by the troops for the sustenance of the horses.

FORAMINIFERA. The Protozoa, or simplest forms of animal forms—so simple that they have been grouped by Haeckel along with objects doubtfully vegetable in a kingdom, Protista, intermediate between the animal and vegetable kingdoms—comprise the two large groups known as Rhizopoda and Infusoria. The Rhizopoda fall into two natural groups, *Foraminifera* and *Radiolaria*, a third consisting of the Sun Animals (*Actinophrya*, &c.), whose position is intermediate. The *Foraminifera* are also named *Reticularia*, because the pseudopods or filamentous prolongations of the soft body anastomose freely and form networks around the main mass; and *Acytaria*, because they possess no central capsule—characters in which they contrast with the *Radiolaria*, so named because the filaments are independent and radial, and known also as *Cytophrya*, because they possess a central capsule. A *Foraminifer* consists of a gelatinous mass containing granules, but

showing no other tendency towards structure. This mass is either naked, as *Lieberkühnia*; or inclosed in a membranous sac with a single opening, as *Gromidia*; or possessed of a calcareous skeleton, as *Miliolina*, *Nummulina*, and the majority of the group. When a test or shell exists the soft sarcode spreads over the outer surface, and in this external sheet the digestive process is probably carried on, only the products of digestion being carried into the interior of the shell. Dr. Carpenter has divided the *Foraminifera* into two groups, the Imperforate and the Perforate. To the former belong the families—1, *Gromidia*; 2, *Miliolina*; 3, *Lituolina*: to the latter the families—4, *Lagenidia*; 5, *Globigerinidia*; and 6, *Nummulinidia*. The classification is based on the absence or presence of apertures in the test, through which pseudopods may project in addition to those thrown out from the terminal orifice of the test. Under the *Gromidia* comes *Lieberkühnia*, in which, though perhaps not absolutely naked, the test is reduced to a minimum, and its potential existence is manifested by the fact that projections occur at only one point of the surface. The membranous flask in which *Gromidia* is lodged resembles that of *Arcella* among amoeboids and of *Euglena* among Radiolarians; but in the former of these two the projections are lobate, and in the latter they do not anastomose. *Miliolina*, the type of the second family, consists of a porcellaneous shell made up of chambers, each of which contains a sarcode mass connected with the preceding and following, by a constricted portion or 'stolon.' The genus is of very wide distribution in space and time, and the varieties in the arrangement of the successive chambers characterize the types known as *Bilobulina*, *Trilobulina*, *Quinqueloculina*, *Spirilloculina*, &c. This genus is intermediate between *Squamulina*, which as a single-chambered (monothalamous) form is lowest in the series, and *Orbitelites*, a very complex many-chambered (polythalamous) form. In *Verticillina* the chambers are arranged in linear order; in *Aricularia* successive rings of chambers may be piled so as to form a cylindrical stem with an open core. The *Lituolina* have arenaceous tests formed of foreign particles, the cement for which is furnished by the animal. The chambers are either in linear order or branched; or partly straight, partly curved; or alternately arranged in double series, but never forming complex spirals. The shell of the perforate *Foraminifera* is almost always vitreous or hyaline form of calcareous matter. Monothalamous forms are such as *Orbulina*, spherical; *Lagena*, flask-shaped; a linear succession of such flasks gives *Nodosaria*; and the bending of such a series culminates at last in the close, flat spiral of *Cristellaria*. Spheres like *Orbulina* grouped together yield the *Globigerina*, which takes so large a part in the calcareous deposits now forming on the floors of oceans; and the mode of aggregation may give very great complexity as well as yield curious resemblances to the forms of spiral shells. In these compound forms the chambers may open separately; in *Rotalia* each chamber opens into its successor, the last alone opening externally. The Nummuline group, the most complex of all, and that which has contributed most largely to the formation of rock masses, one great series of Tertiary limestones, being named from the predominance of Nummulites, offers varieties of form and arrangement unintelligible without elaborate diagrams. Enough has been said to show that the groups of *Foraminifera* are curiously parallel in their varieties of arrangement, and that they are reducible to certain simple types which may be looked on as primary. From the simplest imperforate species up to the Nummuline a gradation is traceable in the manner in which the successive chambers are connected;

symmetry predominates, but the aggregation is sometimes irregular or acervuline. But each cell may be connected with its neighbours, or rather the sarcooid masses in each cell may be connected by a stolon or constricted neck of sarcoide, by this and coarse or fine tubules in addition, or besides by a highly complex canal system. Some forms are free, but many are firmly adherent to the surface on which they are found. The Eozoon has been identified as a Foraminifer by the possession of this complex series of communications between chambers which are both symmetrical and acervuline in their arrangement: the attachment of the Eozoon gives it a sponge-like aspect, in contrast with the definite shapes maintained even by the attached foraminifers of the present day. Foraminifera are universally distributed, and range from palaeozoic times to the present day. The classification adopted here is that of Carpenter; but, long as the Foraminifera have been collected on account of their beauty as microscopic objects, their true relations are comparatively recently recognized. D'Orbigny even placed some of them among the Nautili, whose form they repeat. Future researches may therefore modify the classification of animals which present less difficulty on account of size than because of their great variability.

FORBES, DUNCAN, of Culloden, Lord-president of the Court of Session, was born at Bunchrew, near Inverness, 10th November, 1685. He entered on the study of law in Edinburgh in 1704. In 1705 he went to Leyden, then among the most celebrated universities on the Continent, and in 1707 returned to Scotland, where he continued the study of law till 1709, in which year he was admitted an advocate on 26th July. During his residence at Leyden, in addition to his legal studies, he made considerable progress in Hebrew and other oriental languages. Nearly all the Highland clans were at this time disaffected towards the government. The Forbeses were among the few who could be depended on. On the occasion of the rebellion of 1715, however, young Forbes saw clearly the impolicy of harsh proceedings, and exerted his powers of persuasion against them to such an extent as to excite a suspicion of his own loyalty. The weight of his character was sufficient to dissipate these doubts, and in 1716 he received the crown appointment of advocate-deputy. In 1722 he was returned to Parliament as the ministerial candidate for the Inverness district of boroughs, and in 1725 he was appointed lord-advocate. The first year of his holding this office a curious incident occurred. The introduction of the malt-tax into Scotland led to some riots in Glasgow, which the magistrates of that town were suspected of fomenting. Forbes proceeded thither from Edinburgh, accompanied by General Wade with a military force, arrested the whole of the magistrates on a justice of peace warrant, and after committing them to their own tolbooth, had them conveyed under a strong guard to Edinburgh, and thrown into the common jail, with the intention of proceeding against them in the judicial court. Public feeling declared against this double-handed proceeding, and as its legality was doubtful, the magistrates were liberated and no more was heard of the case. In 1734, in consequence of the death of his brother, John Forbes, he fell heir to the estate of Culloden. In 1736 Edinburgh was in turn the scene of the formidable disorders known as the Porteous mob riots. It was proposed to deprive the city of its privileges. Forbes exerted himself in its favour, and procured important modifications on the bill which passed through Parliament. The improvement of industry was a matter which the condition of the country rendered of the most urgent importance, the unsettled state of affairs having produced

crowds of idlers. Into this enterprise Forbes entered with much pains and perseverance. He is said to have made himself master of the nature and history of almost every manufacture, and to have corresponded extensively with merchants and statesmen as to the means of introducing them into Scotland. He had the satisfaction of seeing his exertions crowned with success, and materially aided in laying the foundations of that commercial prosperity to which his country has since attained. In 1737 he was appointed president of the Court of Session, and applied himself with great zeal to the improvement of the regulations of that court. The cases were formerly taken up at the option of the chief judge, who could thus secure the absence of any judge whose opinion he believed to be hostile; Forbes fixed the order of procedure to that in which the cases stood on the roll. About the same time Forbes proposed a plan which, had it been adopted, might have prevented the rebellion of 1745. It was to organize the Highland clans into regiments under colonels of tried loyalty, so as to give them an interest in the existing order of things. But the jealousy of the government existing in Scotland prevented the execution of this plan from being attempted. Being privately advised of the rising in 1745 he hastened to Culloden, at which he arrived on 13th August. Many of the chieftains were under obligations to him, and his influence prevented several of them from joining the rebellion, and even secured the active support of some for the government. On the 15th October his house at Culloden was attacked by the Frasers, but the attack was repelled, and Lord Lovat, their chief, made him an ample apology, and afterwards sent a message to Charles Edward, requesting him to send and seize Forbes as his greatest enemy. When, after his retreat from England, Charles Edward arrived at Inverness, the lord-president took refuge in Skye, where he remained till after the battle of Culloden. Besides spending his own money in his exertions for the government, he had borrowed £1500 on his own responsibility from well-affected persons. It does not appear that he was ever remunerated. His health soon after began to decline, and he died on the 10th of December, 1747. He wrote several religious works. *Thoughts on Religion*; *Reflections on the Sources of Incredulity in Regard to Religion*; *Letter to a Bishop*; &c.

FORBES, EDWARD, an eminent naturalist, was born at Douglas, Isle of Man, on February 12, 1815, and was the second and eldest surviving child of Edward Forbes, Esq., of Oakhill and Croukbane, near Douglas. He evinced an early aptitude for the observation of natural objects, and among the favourite books of his boyhood were Fenton's *Translation of the Systema Natura of Linnaeus*; Buckland's *Reliquiae Diluvianae*, and similar works, to which he attributed the bent of his life. During his school days he was in the habit of collecting and classifying minerals, fossils, shells, sea-weeds, wild flowers, and insects; and being of a delicate constitution he was encouraged in these pursuits, from their healthful tendency, by his father, who built for him a museum at his country house. He was not particularly distinguished at school, except for the dexterity he had acquired in handling the pencil, which was seldom out of his hands, the margins of his school-books and written exercises being covered with drawings of animals, caricatures, and grotesque figures, such as in future years he was wont to throw off with equal cleverness and humour. In his sixteenth year, having, as a compromise between his own inclinations and the wishes of his parents, made choice of painting as a profession, he went to London and placed himself under Mr. Sams, of Charlotte Street. After

four months' residence his want of vocation for this profession became manifest. His abilities might have sufficed to secure success, but his tastes lay in another direction. He now, in pursuance of the wishes of his father, proceeded to Edinburgh to study medicine, but during a formal attendance upon the medical classes he gave free scope to his natural inclinations, and at the close of his course did not even attempt to take his degree. He had already before entering the university made great advances in the study of natural history. He now became a frequenter of the University Museum, and enrolled himself in the classes of botany and natural history. He thus became acquainted with the actual state of science, and at the close of his university career was ready to add to its resources as an original observer. His first vacation ramble was to Norway, where he botanized for three months in company with a fellow-student, and made a narrow escape from shipwreck on his voyage home. Subsequently he betook himself zealously to the use of the dredge, which he successfully employed for many years in exploring the coasts of the British Islands. In the summer of 1835 he made a tour through France, Switzerland, and Germany, examining the natural history, inspecting the museums, and cultivating the acquaintance of the eminent naturalists of the countries in which he journeyed. Next year he returned to Paris and prosecuted his natural history studies at the Jardin des Plantes, and at the close of the winter course proceeded to the south of France, thence extending his excursion to Algiers, everywhere making acquisitions both in botany and zoology. The results of this tour were published in the *Annals of Natural History*. The winter of 1837-38 was spent at Edinburgh, where the labours of the session were diversified by new contributions to the college magazine, of which he had been an active supporter, and more especially by a series of snow-ball riots, in which Forbes took a leading part. The summer of 1838 was spent on the Continent, visiting Frankfort and Vienna, going through Styria and Carniola to Trieste, returning home by Venice, Milan, and the Simplon. At the British Association meeting in Newcastle this year he read a paper on the Distribution of Terrestrial Pulmonifers in Europe, and was intrusted by the association with the preparation of a report on the distribution of the Pulmoniferous Mollusca of the British Isles. From this time forward to the close of his life he was an active member of that great scientific body, the proceedings of its natural history section being every year enriched by the results of his investigations. In 1839 he lectured before the Edinburgh Philosophical Association on the animals in the British seas. Botany, zoology, and geology supplied materials for reports and papers to the British Association, the naturalists of which were induced by the sociable influence and example of Forbes and his friends to form themselves into a fraternity well known to the frequenters of Section D by the grotesque name of the Red Lions, and in the harmless eccentricities of which the most eminent naturalists of the day have often participated. In 1841 Forbes published the *History of British Starfishes*, a work not more esteemed for its original and accurate observations and vivid descriptions than it is admired for its pictorial illustrations and the ingenuity and quaint humour of its vignettes and tail-pieces. In the same year he accepted of an engagement as naturalist to the surveying squadron in the Mediterranean, and was rated on the books of H.M.S. *Beacon*, under the command of Captain Graves, who became thenceforward his fast friend. Before the summer was over, Forbes had dipped his dredge for the first time in the Grecian seas, and speedily sur-

rounded himself amongst his naval comrades with an eager band of botanists, zoologists, and geologists. 'The first lieutenant,' says Capt. Graves, 'though anxious, as all first-lieutenants are, to keep the decks clean, never objected to the contents of the *trawl* being spread out, but almost became a co-... Forbes made excursions over Paros, after exploring the flora and fauna of which, he availed himself of a triangulating cruise with Lieutenant Spratt to visit Naxia and other islands of the Cyclades. The general result of Forbes' investigations in these seas by means of the dredge was to establish the fact of the existence of 'a defined fauna different from any other of the marine zones, between 90 and 200 fathoms, and an exact correspondence in its productions over all the examined parts of the *Ægean*, a stretch of 200 miles.' Another cruise afforded him an opportunity of inspecting the shores of Asia Minor, where he visited the ruins of Xanthus and other ancient cities, ascended the mountains of Massicotus to a height of about 9000 feet, and examined the natural history of a country till then unexplored. An account of this tour was combined by Forbes with that of a later journey, and published in 1847, in conjunction with Lieutenant Spratt, under the title of *Travels in Lycia*. For two months after his first Lycian researches Forbes was employed, along with Capt. Graves, Sir C. Fellows, and Lieut. Spratt, in excavating and removing the Xanthian marbles; after which Forbes, Spratt, and the Rev. Mr. Daniell proceeded on the exploratory journey through Lycia, the results of which were published in the work already named. His return to England was hastened by the prospect of his being appointed to the chair of botany in King's College, London. On arriving in the Thames in October, 1842, he received the intelligence of his election to this office, to the duties of which were soon added those of curator of the collections of the Geological Society of London. But his new career made demands upon his time and labour which precluded the possibility of his addressing himself to the task of arranging and classifying the mass of materials collected by him in the Mediterranean; and we find him ere long complaining that while he is making abstracts, writing catalogues, and doing other people's work, the object that lay nearest his heart behoved to be put aside, adding characteristically that presently 'some rascally Frenchman would sift the Mediterranean, and claim the glory for his own country.' Both offices are described by him as 'hard work, no play, and little pay.' The great aim of his ambition was to fill the chair of natural history in the University of Edinburgh, and for ten long years he waited for the vacancy which fulfilled his utmost desires. In the meantime he devoted himself vigorously to his London work, occupying his few spare hours in preparing his *Ægean* researches for publication, for which Sir Robert Peel's government granted £500. The post of paleontologist to the Geological Survey, to which he was preferred in 1844, relieved him from the engrossing drudgery of his metropolitan life, and changes of scene and occupation restored him to his wonted health and spirits. Betwixt the years 1848 and 1852 he began and completed, in conjunction with Mr. Hanley, the well-known work descriptive of the British Mollusca, in four vols. 8vo. In 1848 he prepared for the Ray Society, in one vol. 4to, the *Monograph of the Naked-eyed Medusæ*. In the same year he was united in marriage to Miss Ashworth, daughter of the late General Sir C. Ashworth. On the opening of the School of Mines, in connection with the Museum of Practical Geology, Forbes was appointed lecturer on natural history as applied to geology and the arts. He still retained his profes-

scholarship of botany at King's College, and continued to contribute annually some of his most valuable memoirs to the British Association, besides writing for scientific and literary journals. A Natural History of the European Seas was commenced and partly printed, but was left unfinished at his death, being afterwards completed by Mr. Austen. The professorship of natural history in the University of Edinburgh was at length, on the death of Jameson, conferred on Edward Forbes in 1854, and in the month of May of that year he left London to take his place as a teacher in the institution which two-and-twenty years before he had entered as a student. He was under the necessity of delivering his first summer course of lectures with little time for preparation, but the course, although entailing arduous labour in the way of illustration, was in every respect most successful. His lectures embraced zoology and geology, the latter including, of course, paleontology; and one of the most memorable features of his lecturing was the facility and grace with which he drew on the black-board outlines of the animal structures which he described, the movement of his hand in delineating these forms being often followed by an involuntary murmur of admiration on the part of the audience. At the Liverpool meeting of the British Association in the same year he was elected president of the geological section. He returned to Edinburgh some weeks before the opening of the college session, and had only commenced his class when he evinced some symptoms of the recurrence of the remittent fever he had caught in Greece. In spite of the best medical skill and the suspension of his lectures, the febrile symptoms increased, and he died on Nov. 18, 1854, aged 39. His active public life did not exceed five-and-twenty years, but into that period were crowded the labours and triumphs of the longest career; yet his work was only half done; and, as was remarked of the father of modern geology, the loss sustained by his death was aggravated by the consideration of how much of his knowledge had perished with himself, and notwithstanding all that he had written, how much of the light collected by a life of experience and observation was now extinguished. Forbes became a fellow of the Royal Society in 1845. (Memoir of Edward Forbes, by Prof. George Wilson, continued by Archibald Geikie of the Geological Survey.)

FORBES, JAMES DAVID, natural philosopher, was born at Colinton, near Edinburgh, 20th April, 1809. He was educated at the University of Edinburgh, and admitted to the Scottish bar in 1830. In 1833 he was appointed to the chair of natural philosophy in the University of Edinburgh. In 1860 he became principal of the United Colleges of St. Salvador and St. Leonard, in the University of St. Andrews. He died at Clifton, 31st December, 1868. Professor Forbes was in 1842 made a corresponding member of the Institute of France, and he had numerous medals from the Royal Society, and other scientific associations; but his fame rests chiefly on his study of glaciers. His chief publications on this subject are: *Travels through the Alps of Savoy* (1843); *Norway and its Glaciers* (1853); *Tour of Mont Blanc and Monte Rosa* (1855); and *Occasional Papers on the Theory of Glaciers* (1859). Forbes' theory of the glacier was that it was a viscous body, urged down slopes of a certain inclination by the mutual pressure of its parts. A controversy was begun between Dr. Tyndall and Forbes, and continued by Forbes' friends after his death, as to the first suggestion of this theory, which Tyndall claimed for Rendu. It seems that in any case Forbes was not aware of the result of Rendu's investigations at the time of making his own. See the article *GLACIER* for further information on this subject.

FORBES, SIR JOHN, an eminent physician, born in Banffshire in 1787. He received his professional education at Marischal College, Aberdeen, and the University of Edinburgh, graduating M.D. at the latter in 1817. Previous to this time he had been a surgeon in the royal navy, from which he retired on half-pay in 1816. He first settled at Penzance, and afterward at Chichester. In 1840 he settled in London, and soon became physician extraordinary to the Prince Consort, and physician to the Queen. In 1853 he was knighted. He died at Whitechurch, Oxfordshire, 13th November, 1861. His first works which brought him into notice among his brethren were his translations of the writings of Avenbrugger and Laennec, on auscultation and the use of the stethoscope, especially his translation of Laennec, which has gone through several editions. They had the merit of turning the attention of the medical faculty in this country to the improved methods of physical diagnosis which now form so important a part of medical practice. In the latter part of 1838 he arranged the plan of the *Cyclopædia of Practical Medicine*, which was completed in 1835, and as editor of it, along with Dr. Conolly, he contributed some of the best articles in the work. He was also the founder of the British and Foreign Medical Review, and its editor until its union with *Medico-Chirurgical Review* changed its name into that of the British and Foreign Medico-Chirurgical Review. In 1840 he published *A Physician's Holiday*, or a Month in Switzerland; in 1852, *M'moranda made in Ireland in the Autumn of 1852*; in 1856, *Sight-seeing in Germany and the Tyrol in the Autumn of 1855*; and in 1857, *Nature and Art in the Cures of Disease*.

FORBES MACKENZIE ACT. An act for the better regulation of the public-houses of Scotland, passed 15th August, 1853 (16 and 17 Vict. cap. lxxvii), is popularly known by this title, as it was introduced in the House of Commons by Forbes MacKenzie, member for Liverpool, although its author was Lord Kinnaird. See *LICENSING ACTS*.

FORCE. That which produces, or tends to produce motion is called force. The muscular power of animals, pressure, the attraction of gravity, electric and magnetic attraction, are forces. Impact also may give rise to the exhibition of elastic forces, and so may any kind of strain produced in elastic bodies. Here the recoil after the impact, or the tendency of the elastic body which has been strained or compressed to recover its original form or volume, gives rise to the motion. Forces are measured in two ways. Either they are measured by their effect in producing motion, or else they are compared with the force of gravity. The latter is a very common mode of reckoning for ordinary purposes. Thus steam pressure is reckoned in pounds weight per square inch of the surface exposed to it; and the breaking stress of a wire may be stated in terms of the number of pounds weight that just suffice to break it. Here the pressure on the surface of the boiler per square inch, and the bearing power of the wire, are compared with the force with which a 1 lb. mass is attracted towards the earth. On this system of measurement the unit of force is the weight (that is, the downward pressure under gravity) of the unit of mass. Thus, in English measurements, the weight of 1 lb. is the unit of force; in the metrical system the weight of 1 gramme is the unit. This system is distinguished by scientific writers from that which is about to be described by the name *gravitation measure*. The weight of 1 lb. is the *British gravitation unit of force*.

It will be understood from our article *GRAVITY* that the force of gravity varies from place to place on the earth's surface, and that it varies also if we

leave the earth's surface either by ascending into the air or by descending into the earth—for example, into a deep mine. For this reason a 1 lb. mass would be found to have slightly different weights, if tested by a spring balance, in different localities. The unit of force is thus seen to be variable; and although these variations are so slight that the effect of them is imperceptible in such cases as that of steam pressure, or the other that we have instanced, nevertheless a variable unit is plainly altogether unsuitable for scientific purposes. A unit founded on the effect of force in producing motion is therefore defined in the following way, and it is known as the *absolute unit of force*, or, which is better, the *kinetic unit of force*. The kinetic unit of force is the force that is capable of generating unit quantity of motion in unit of time. As unit quantity of motion is defined to be (see MOMENTUM) unit of mass moving with unit velocity, the unit of force may be defined as a force which, if allowed to act freely on unit of mass for unit of time, would generate in it unit velocity; and if we choose as our units of mass, length, and time the British pound and foot, and the second, we may say, specifically, that the British kinetic unit of force is the force which, if applied to a mass of 1 lb. for a second of time, would give that mass a velocity of 1 foot per second. The unit here explained is found to have great convenience for scientific calculations; the simplification that it introduces into explanations and formulas in dynamics is of great importance. It may readily be compared with the ordinary engineer's unit, the weight of a pound, in the following way. It is known by experiment that a body allowed to fall freely from rest acquires, in our latitude, a velocity of 32.2 feet per second in one second. Thus a pound allowed to fall freely acquires that velocity. The acting force that sets the pound mass in motion is, it is plain, its own weight; that is to say, the gravitation unit of force applied to unit of mass generates in one second a velocity of 32.2 feet per second; thus the weight of a pound, in our latitude, is 32.2 kinetic units of force.

The effects of a force depend on the circumstances under which the force is applied. It may be applied so as to compel rest or to prevent change of motion, or it may be applied so as to produce or to change the motion of bodies. Dynamics is the branch of science under which the effects of forces are considered: the name Mechanics, however, is the popular name under which this branch of science goes. When a force is applied so as to produce motion against resistance, or to overcome resistance to the motion, the force is said to *do work*. Under WORK will be found some particulars on this subject.

FORCE, ANIMAL (applied to perform work). All machines are impelled either by the exertion of animal force or by the application of the powers of nature. The latter comprise the potent elements of water, air, and fire. The former is more common, yet so variable as hardly to admit of calculation. It depends not only on the vigour of the individual, but on the different strength of the particular muscles employed. Every animal exertion is attended by fatigue; it soon relaxes, and would speedily produce exhaustion. The most profitable mode of applying the labour of animals is to vary their muscular action, and revive its tone by short and frequent intervals of repose. The ordinary method of computing the effects of human labour is from the weight which it is capable of elevating to a certain height in a given time. This was reckoned by Daniel Bernoulli and Desaguliers at 2,000,000 lbs. avoirdupois, which a man could raise 1 foot in a day. But our civil engineers have gone much farther, and are accus-

tomed, in their calculations, to assume that a labourer will lift 10 lbs. to the height of 10 feet every second, and is able to continue such exertion for ten hours each day, thus accumulating the performance of 3,600,000 foot-pounds of work per day. But this estimate seems to be drawn from the produce of momentary exertions under the most favourable circumstances; and it therefore greatly exceeds the actual results, as commonly depressed by fatigue, and curtailed by the unavoidable waste of force. Coulomb has furnished the most accurate and varied observations on the measure of human labour. A man will climb a stair, from 70 to 100 feet high, at the rate of 45 feet in a minute. Reckoning his weight at 155 lbs., the animal exertion for one minute is 6975, and would amount to 4,185,000 if continued for ten hours; but such exercise is too violent to be often repeated in the course of a day. A person may clamber up a rock 500 feet high, by a ladder-stair, in twenty minutes, and, consequently, at the rate of 25 feet each minute; his efforts soon begin to be unpaired, and the performance reaches only 3875 lbs. in a minute. But, under the encumbrance of a load, the quantity of action is still more remarkably diminished. A porter, weighing 140 lbs., was found willing to climb a stair 40 feet high 266 times in a day; but he could carry up only sixty-six loads of firewood, each of them 168 lbs. weight. In the former case his daily performance was very nearly 1,500,000; while in the latter it amounted only to 808,000. The quantity of permanent effect was hence only about 700,000, or scarcely half the labour exerted in mere climbing. In the driving of piles, a load of 42 lbs., called the *ram*, is drawn up 3½ feet high twenty times in a minute; but the work has been considered so fatiguing as to endure only three hours a day. This gives about 530,000 for the daily performance. Nearly the same result is obtained by computing the quantity of water which, by means of a double bucket, a man drew up from a well. He lifted 36 lbs. 120 times in a day from a depth of 120 feet, the total effect being 518,400. A skilful labourer, working in a field with a large hoe, creates an effect equal to 728,000. When the agency of a winch is employed in turning a machine, the performance is still greater, amounting to 845,000. The following observations will also be found interesting, although it is not possible to express them in terms of foot-pounds of work done. The idea of doing work necessarily involves resistance to the force that is doing the work. In the case of horizontal transport we have in most cases no means of estimating the amount of resistance encountered. A porter in London is accustomed to carry a burden of 200 lbs. at the rate of 3 miles an hour. This is greatly inferior, however, to the labour performed by porters in Turkey, the Levant, and generally on the shores of the Mediterranean. At Constantinople an Albanian porter will carry 800 or 900 lbs. on his back, stooping forward, and assisting his steps by a sort of staff. At Marseilles four porters commonly carry the immense load of nearly 2 tons by means of soft hods passing over their heads and resting on their shoulders, with the ends of poles, from which the hods are suspended. The Greek seamen, in the Dardanelles, are esteemed more skilful and vigorous in the act of rowing than those of any other nation. The Chinese, applying both their hands and their feet, are said to surpass all people in giving impulsion to boats by sculling. The several races of men differ materially in strength, but still greater diversity results from the constitution and habits of the individual. The European and his American descendants are, on the whole, more powerful than the other inhabitants of the globe; and man reared in civil-

ized society is a robust and more vigorous animal than the savage. In the temperate climates, likewise, men are capable of much harder labour than under the influence of a burning sun. Coulomb remarks that the French soldiers employed on the fortifications of the Isle of Martinique became soon exhausted, and were unable to perform half the work executed by them at home. The most violent and toilsome exertion of human labour is performed in Peru by the carriers or *cargueros*, who traverse the loftiest mountains, and clamber along the sides of the most tremendous precipices, with travellers seated in chairs strapped to their backs. In this manner they convey loads of 12, 14, or even 18 stone; and possess such strength and action as to be able to pursue their painful task eight or nine hours for several successive days. When a man stands, he pulls with the greatest effect; but his power of traction is much enfeebled by the labour of travelling. If v denote the number of miles which a person walks in an hour, the force in pounds pressure which he exerts in dragging forward a load will be expressed nearly by $\frac{1}{2}(12-2v)^2$. Thus, when at rest, he pulls with a force of about 29 lbs. avoirdupois; but if he walks at the rate of 2 miles an hour his power of traction is reduced to 14 lbs.; and if he quicken his pace to 4 miles an hour, he can draw only 3 lbs. There is, consequently, a certain velocity which procures the greatest effect, or when the product of the traction by the velocity becomes a maximum. This takes place when he proceeds at the rate of 2 miles an hour. The utmost exertion which a man, walking, might continue to make, in drawing up a weight by means of a pulley, would amount, therefore, in a minute, only to 2450; but if he applied his entire strength, without moving from the spot, he could produce an effect of 3675.

The labour of a horse in a day is commonly reckoned equal to that of five men; but then he works only eight hours, while a man easily continues his exertions for ten hours. Horses, likewise, display much greater force in carrying than in pulling; and yet an active walker will beat them on a long journey. Their power of traction seldom exceeds 144 pounds, but they are capable of carrying more than six times as much weight. The pack-horses in the West Riding of Yorkshire are accustomed to transport loads of 420 lbs. over a hilly country. But in many parts of England the mill-horses will carry the enormous burden of 910 lbs. to a short distance. With regard, however, to the ordinary power of draught, the formula $(12-v)^2$, where v denotes the velocity in miles an hour, will perhaps be found sufficiently near the truth. Thus a horse, beginning his pull with the force of 144 lbs., would draw 100 lbs. at a walk of 2 miles an hour, but only 64 lbs. when advancing at double that rate, and not more than 36 lbs. if he quickened his pace to 6 miles an hour. His greatest performance would hence be made with the velocity of 4 miles an hour. The work in a minute will then amount to 22,528. The measure generally adopted for computing the power of steam-engines is much higher, the labour of a horse being reckoned sufficient to raise, every minute, to the elevation of 1 foot, the weight of 33,000 lbs. But this estimate is not only greatly exaggerated, but should be viewed as merely an arbitrary and conventional standard. Wheel carriages enable horses on level roads to draw, at an average, loads about fifteen times greater than the power exerted. The carriers between Glasgow and Edinburgh transported, in a single horse cart, weighing about 7 cwt., the load of a ton, and travelled at the rate of 22 miles a day. At Paris, one horse, in a small cart, conveys along the streets half a cord of wood, weigh-

ing 2 tons; but three horses yoked in a line are able to drag 105 cwt 5½ lbs., or that of a heavy cart loaded with building stones. The Normandy carriers travel from 14 to 22 miles a day, with two-wheeled carts, weighing each 11 cwt., and loaded with 79 cwt., or nearly 4 tons, of goods, drawn by a team of four horses. The French draught-horses, thus harnessed to light carriages, are more efficient, perhaps, than the finer breeds of England. They perform very nearly as much work as those in the single horse carts used at Glasgow, and far greater than those heavy animals which drag the lumpish and towering English waggons. The London dray-horses, in the mere act of ascending from the wharfs, display a powerful effort, but they afterwards make little exertion, their force being mostly expended in transporting their own ponderous mass along. Oxen, on account of their steady pull, are in many countries preferred for draught. They were formerly employed universally in the various labours of husbandry. The tenderness of their hoofs, unless shod, however, makes them unfit for pulling on paved roads, and they can work only with advantage in soft grounds. But they want all the pliancy and animation which are the favourite qualities of the horse. The patient drudgery of the ass renders him a serviceable companion of the poor. Much inferior in strength to the horse, he is maintained at far less cost. In temperate climates an ass will carry about 2 cwt. 22 miles a day. But in the warmer climates he becomes a larger and finer animal, and trots or ambles briskly under a load of 150 lbs. The mule is still more powerful and hardy, being fitted equally for burden and draught. In the hotter parts of Asia and Africa the ponderous strength of the elephant has been long turned to the purposes of war. He is reckoned more powerful than six horses, but his consumption of food is proportionally great. The elephant carries a load of 3000 or 4000 lbs; his ordinary pace is equal to that of a horse trot; he travels easily over 40 or 50 miles in a day, and has been known to perform in that time a journey of 110 miles. His sagacity directs him to apply his strength according to the exigency of the occasion. The camel is a most useful beast of burden in the arid plains of Arabia. The stronger ones carry a load of 10 or 12 cwt., and the weaker ones transport 6 or 7 cwt.; they walk at the rate of 24 miles an hour, and march about 30 miles every day. The camel travels often eight or nine days without any fresh supply of water. When a caravan encamps in the evening he is perhaps turned loose, for the space of an hour, to browse on the coarsest herbage, which serves him to ruminate during the rest of the night. In this manner, without making any other halt, he will perform a dreary and monotonous journey of 2000 miles.—Within the Arctic circle, the reindeer, as a domesticated animal, is not less valuable. He not only feeds and clothes the poor Laplander, but transports his master with great swiftness in a covered sledge over the snowy and frozen tracts. The reindeer subsists on the scanty vegetation of moss or lichens, and are docile, but not powerful. Two of them are required to draw a light sledge: so harnessed, they will run 50 or 60 miles on a stretch, and sometimes perform a journey of 112 miles in the course of a day. But such exertions soon wear them out. The llama of South America is commonly used as a beast of burden in Peru and other parts, and is, indeed, peculiarly fitted for the lofty regions of the Andes. The strongest of them carry only from 150 to 200 lbs., but perform about 15 miles a day over the roughest mountains. They generally continue this labour during five days, and are then allowed to halt two or three days before they renew their task.

FORCELLINI, EGIDIO, an Italian scholar, celebrated as a lexicographer, was born in 1688, in a village not far from Feltra, in the ancient Venetian territory. The poverty of his parents prevented him from going to school, and he was almost grown up when he began to study Latin in the seminary at Padua. His teacher in this language, who soon became his friend, was Professor Faccioliati (which see). Forcellini made rapid progress in the ancient languages, and assisted Faccioliati in his new and greatly augmented edition of Calepin's dictionary of seven languages. The two friends then resolved to publish a complete Latin dictionary. The execution of this work fell almost entirely upon Forcellini, and occupied him for forty years. It was published under the title *Totius Latinitatis Lexicon, Concilio et Cura Jacobi Faccioliati, opera et Studio Egidii Forcellini, &c.* (Padua, 1771, four vols. folio). Before it appeared Forcellini had died in 1768. An English edition was published in 1828, and improved editions have since appeared on the Continent.

FORCEPS, in surgery, a two-bladed instrument of the nature of pincers or tongs for seizing, holding, and in some cases for cutting either tissue or bone. By dentists forceps are used for extracting teeth, and by accoucheurs for seizing and steadying the head of the fetus during delivery or extracting the fetus.

FORCES, COMPOSITION AND RESOLUTION OF. See **MECHANICS**.

FORCIBLE ENTRY (English law) is the violently taking possession of lands or tenements with arms or menaces. By the ancient common law, he who had the right of entry into lands might make entry by force; but, this liberty being abused, a statute was passed in the time of Richard II., and subsequently other statutes, subjecting a party who should make forcible entry into lands to indictment for breach of the peace, and provision has also been made for a summary process to be issued by two justices of the peace for the purpose of restoring the party thus forcibly expelled, or kept out of his lands, to the possession.

FORCING, a method of cultivation employed by gardeners for the purpose of producing vegetables or fruits, by artificial heat, before their proper season. The cultivation of exotic plants and trees in hot-houses, in which a temperature is kept up corresponding to that of the country to which they belong, is not, therefore, forcing in the proper sense, as these usually flower and fruit at their proper seasons. Forcing is by no means a modern invention. It was practised by the Romans in the times of the first emperors, and the table of Tiberius was supplied with cucumbers all the year round by this means, the method being not greatly different from that still employed. Heat was obtained by frames filled with hot dung, and light was admitted through thin plates of talc, which would doubtless answer the purpose exceedingly well, especially under the strong light of an Italian sky. Dung-beds are still largely used for forcing, though, of course, hot-water pipes are also extensively employed to give the requisite heat, while glass has taken the place of the plates of talc. A large number of vegetables and fruits are now forced, but the process is necessarily, in many cases, very expensive. Among vegetables we may notice the asparagus, carrot, cucumber, kidney-bean, lettuce, mushroom (this is successfully grown in the dark), potato, sea-kale, radish, and rhubarb; among fruits, the apricot, cherry, fig, gooseberry and currant, peach, pine-apple, strawberry, plum, and grape. Differences naturally exist between the methods employed for each, but we cannot enter upon details.

FORD, JOHN, an English dramatic author, was born in Devonshire in 1586, and entered the Mid-

dle Temple in 1602. He published in 1606 a piece entitled *Fame's Memorial*, a species of monody on the Earl of Devonshire, which poem, considered as the production of a youth, exhibits great freedom of thought and command of language. He printed his first tragedy of the *Lover's Melancholy* in 1629. This, however, was not his first play, as a comedy of his, entitled *A bad Beginning has a good End*, was acted in 1613. His genius is seen at its highest in the tragedy, *'Tis Pity Shee's a Whore* (1633), though the subject is repulsive. He wrote, or assisted to write, at least eleven dramas. Most of these were exclusively his own composition; but some of them were written in conjunction with Decker and others. The date of his death is uncertain; but it is thought that he did not long survive 1639. Other plays by him are: *The Broken Heart* (1633); *Love's Sacrifice* (1633); *Perkin Warbeck* (1634); *The Fancies Chaste and Noble* (1638); and *The Ladies' Trial* (1638). As a dramatic writer he is often elegant and elevated, and uniformly easy and harmonious. His genius was most inclined to tragedy, but he was too fond of an accumulation of tragic incidents. Besides the works already mentioned, he wrote an able little manual, entitled *A Line of Life*, pointing out the *Immortalitie* of a *Virtuous Name* (1620, 12mo). In 1827 Gifford issued an edition of Ford's works, which was revised and reissued by Dyce in 1869. There is also an edition of Ford and Massinger by Kestley Coleridge.

FORD, RICHARD, author of Murray's *Handbook for Spain*, was born in 1796, and educated at Winchester School and Trinity College, Oxford, where he took his B.A. degree in 1817. He then studied law and was called to the bar, but never practised. From 1830 to 1834 he resided with his wife and family in southern Spain, and on his return to England in the latter year he took up his residence near Exeter. About this time he became a contributor to the *Quarterly Review* and other periodicals, and in 1845 he published the original edition of his excellent *Handbook for Travellers in Spain*, a storehouse of information regarding Spain and all things Spanish, rich alike in knowledge and in wit and humour. In subsequent editions this work underwent various changes, and was much reduced in bulk. He died at his residence on Sept. 1, 1858.

FORDUN, JOHN, Scottish historian, is supposed to have been born early in the fourteenth century, and to have been a chantry priest of Aberdeen, but practically nothing is known of his life. To procure materials, he is said to have travelled on foot in England, Scotland, and Ireland. His writings, afterwards incorporated in the *Scottish chronicon* of Walter Bower, consist of *Chronica Gentis Scottorum*, and its continuation, *Gesta Analia*, coming down to 1385, which appears to have been the year of his death. The early part of his history is largely fabulous, but the later part of it is not to be judged by the same standard; and according to Mr. Skene, 'in the twelfth and thirteenth centuries it forms the indispensable groundwork of our annals, while in the fourteenth century it becomes a contemporary authority'. The work was speedily diffused among the convents of his own country and those of England, and formed the basis for many subsequent histories. It was adopted for this purpose about 1441 by Walter Bower, abbot of the monastery of Inchcolm, by whom the five books of Fordun's *Chronicle* were enlarged, and eleven new ones compiled (partly from his materials), bringing the history down to 1487—the *Scottish chronicon* thus produced being Bower's rather than Fordun's. Thomas Hearne published an edition of Fordun's own work, with a continuation, at Oxford, in 1722. An-

other edition, with Bower's continuation, was published at Edinburgh by Goodall in 1759. The best edition of Fordun's history is that edited by W. F. Skene, Edinburgh, 1871-72, two vols. (the first containing the text, the second translation, notes, &c.)

FORE, the distinguishing character of all that part of a ship's frame and machinery which lies near the stem.

FORE AND AFT, throughout the ship's whole length, or from end to end; it also implies, in a line with the keel.

FORE BOW-LINE, the bow-line of the foresail. See **BOW-LINE**.

FORE BRACES, ropes applied to the fore yard-arms to change the position of the foresail occasionally.

FORECASTLE, a short deck placed in the fore part of a ship, above the upper deck; or the fore part of the upper deck at the bows. In merchant vessels it is the place in which the sailors sleep and take their meals. Formerly this part of the vessel was a lofty castle-like structure. *Forecastle men* are sailors stationed on the fore-castle, who are generally prime seamen.

FORECLOSED, in law, signifies the being shut out, and excluded or barred the equity of redemption on mortgages, &c.

FORECLOSURE, in English law, is the right of a mortgagee, or of any one having interest in a mortgage, in the event of the conditions of the mortgage being violated, to compel the mortgagor to redeem the pledge or forfeit his right of redemption. This is done by filing a bill for foreclosure. By 15 and 16 Vict. cap. lxxvi. the court may, on application of the mortgagee, mortgagor, or any encumbrancer of the mortgage, grant, under certain conditions, a sale of the subject instead of foreclosing the mortgage.

FOREIGN ATTACHMENT. See **ATTACHMENT (FOREIGN)**.

FOREIGN BILL OF EXCHANGE. See **BILL—BILL OF EXCHANGE**.

FOREIGN ENLISTMENT. See **ENLISTMENT**.

FORELAND, a cape or promontory projecting into the sea, as the North and South Forelands.

FORESHORTENING, in drawing and painting, the art of representing figures of all sorts as they appear to the eye in oblique positions. This art, which in many instances is very difficult, was known to the Greeks; and Pliny speaks particularly as to its being successfully practised by Parrhasius and Pausias. Among the moderns, Correggio must be allowed the palm for excellence in foreshortening. In painting ceilings it is particularly important. In a celebrated picture of the body of Christ lying horizontally, the figure is so much foreshortened that the toes almost touch the chin.

FORESTALLING. See **ENGROSSING, FORESTALLING, AND REGRATING**.

FOREST MARBLE, in geology, a member of the Lower Oolite formation. See **GEOLOGY**.

FORESTS. The great importance of wood to society, and the rapid decrease of forests in populous countries, if particular care is not taken of them, have led, in modern times, to a careful investigation of the subject of the management of forests, and everything connected with it. The Germans, who first taught mining as a science, were the first who treated scientifically of the management of forests and established forest academies, in which all branches of the knowledge relating to them are taught. These establishments originated from the increasing scarcity of wood, which rendered the careful management of the forests necessary, and from the plan of raising a revenue on the part of the government by

the sale of the wood. Mr. Zanthier first introduced instruction in the forest sciences as a particular branch of study at Eisenburg, in Stolberg-Wernigerode, near the Harz Mountains. Prussia soon directed her attention to them; and at present no person in that country is appointed to an office in the forest department without having undergone a strict examination in the branches of knowledge connected with the forests, and having served personally in the forests for a considerable length of time. There are a number of forest academies in different parts of Germany and other European countries, but in Britain less attention is paid to this subject. The principal branches taught in them are the following: forest botany, mineralogy, zoology, chemistry, by which the student learns the natural history of forests, and the mutual relations, &c., of the different kingdoms of nature. He is also instructed in the surveying and cultivation of forests, so as to understand the mode of raising all kinds of wood, and supplying a new growth as fast as the old is taken away; and in the administration of the forest taxes and police. Forestry is taught in the Royal Indian Engineering College at Cooper's Hill, near London, and in one or two other British institutions, and efforts are being made to establish a school of forestry for the United Kingdom.

The English forest laws have reference only to the preservation of game—'With regard (says Blackstone, Com. vol. ii. page 413) to the rise and original of the present civil prohibitions on the destruction of game in Europe, it will be found that all forest and game laws were introduced into that part of the world at the same time, and by the same policy as the feudal system, when the swarms of barbarians issued from their northern hive, and laid the foundation of most of the present kingdoms of Europe on the ruins of the Western Empire. For when a conquering general came to settle the economy of a vanquished country, and to part it out among his soldiers or feudatories, who were to render him military service for such donations, it behoved him to keep the natives of the country, and all persons who were not his military tenants, in as low a condition as possible, and especially to prohibit them the use of arms. Nothing could do this more effectually than a prohibition of hunting or sporting; and therefore it was the policy of the conqueror to reserve this right to himself and those on whom he should bestow it, who were only his capital feudatories or greater barons. And accordingly we find in the feudal constitution one and the same law prohibiting the *rustici* in general from bearing arms, and also proscribing the use of snares, nets, or other engines for destroying the game. This exclusive privilege well suited the martial genius of the conquering troops, who delighted in a sport which, in its pursuit and slaughter, bore some resemblance to war. And, indeed, like some of their modern successors, they had no other amusement to entertain their vacant hours, despising all arts as effeminate, and having no other learning than was couched in such rude ditties as were sung at the solemn carousals which succeeded these ancient huntings. And it is remarkable that, in those nations where the feudal policy remains most uncorrupted, the forest or game laws continue in their highest rigour.

'In France all game was properly the king's; and in some parts of Germany it is death for a peasant to be found hunting in the woods of the nobility. In Britain also hunting has always been esteemed a most princely diversion and exercise. The whole island was replenished with all sorts of game in the times of the Britons, who lived in a wild and pastoral manner without inclosing or improving their

grounds, and derived much of their subsistence from the chase, which they all enjoyed in common. But when husbandry took place under the Saxon government, and lands began to be cultivated, improved, and inclosed, the beasts naturally fled into the woody and desert tracts, which were called *forests*, and not having been disposed of in the first distribution of lands, were therefore held to belong to the crown. These were filled with great plenty of game, which our royal sportsmen reserved for their own diversion on pain of a pecuniary forfeiture on the part of such as interfered with their sovereign. But every freeman had the full liberty of sporting upon his own territories, provided he abstained from the king's forests. However, upon the Norman Conquest, a new doctrine took place, and the right of pursuing and taking all beasts of chase or venery and such other animals as were accounted game was held to belong to the king, or to such only as were authorized under him. The right thus newly vested in the crown was exerted with the utmost rigour at and after the time of the Norman establishment, not only in the ancient forests, but in the new ones which the Conqueror made by laying together vast tracts of country, depopulated for that purpose, and reserved solely for the king's royal diversion; in which were exercised the most horrid tyrannies and oppressions, under the colour of forest law, for the sake of preserving the beasts of chase; to kill any of which, within the limits of the forest, was as penal as the death of a man. And in pursuance of the same principle King John laid a total interdict upon the *winged* as well as the four-footed creation: '*capturam avium per totam Angliam interdixit*'. The cruel and insupportable hardships which those forest laws created to the subject occasioned our ancestors to be as zealous for their reformation as for the relaxation of the feudal rigours and the other exactions introduced by the Norman dynasty, and accordingly we find the immunities of *carta de foresta* as warmly contended for, and extorted from the king with as much difficulty as those of *magna carta* itself. By this charter, confirmed in Parliament, many forests were disafforested or stripped of their oppressive privileges; and regulations were made in the regimen of such as remained; particularly killing the king's deer was made no longer a capital offence, but only punished by a fine, imprisonment, or abjuration of the realm. And by a variety of subsequent statutes, together with the long acquiescence of the crown without exerting the forest laws, this prerogative is now become no longer a grievance to the subject.' The royal forests of Scotland were as numerous, and the forest laws as oppressive as those of England.

Forest as a right in law consists in the exclusive privilege of hunting wild animals within a certain territory. It belongs originally to the sovereign, but may be vested in a subject. There were formerly forest courts in England for the administration of the forest laws, but they, as well as the laws themselves, have long fallen completely into desuetude.

FORETOP MEN, men stationed in the foretop, in readiness to set or take in the smaller sails, and to keep the upper rigging in order.

FORFAR, or **ANGUS**, a maritime county on the east coast of Scotland, bounded n. by counties Aberdeen and Kincardine, w. by Perth, e. by the Firth of Tay, and s. by the German Ocean; length, north-west to south-east, 36 miles; breadth, about 30 miles; area, 562,162 acres. The surface is covered in the west and north-west by a portion of the Grampians, known by the name of the Braes of Angus, nowhere exceeding 3502 feet; and in the south by part of the Sidlaw Hills, not more than 1498 feet high, but presenting several conspicuous summits. Between the

Grampians and the Sidlaw Hills lies part of the fine valley of Strathmore, and between the Sidlaw Hills and the Tay is the level but rich and highly cultivated tract of which the Carse of Gowrie forms a part. The chief rivers are the N. Esk and the S. Esk. All the operations of agriculture are carried on in the most approved manner, and the crops of wheat especially, and of oats, barley, potatoes, and turnips, are scarcely surpassed by those of any county in Scotland. Cattle rearing is carried to great perfection, the chief breeds being aborthorns and polled Angus. The total area under cultivation is about 250,000 acres, of which fully one third is under corn and other rotation crops, and about one-eighth under permanent pasture. Mountain and heath-land used for grazing occupies about 195,000 acres, woods over 29,000 acres. The staple manufacture is coarse linens, which is carried on in Dundee, Montrose, Forfar, Arbroath, Brechin, Kirriemuir, &c., Dundee being the chief centre both for linens proper and jute goods. No minerals of consequence are wrought, except flagstones in the Arbroath district. Limestone and slate are found, but not much wrought. The county returns one member to Parliament. Pop. in 1891, 277,736; in 1901, 284,078.

FORFAR, a royal burgh in Scotland, capital of the county of the same name, situated in the valley of Strathmore, 18 miles north by east of Dundee, beside a small lake. It is on the north-eastern section of the Caledonian Railway, and there is also a branch line from Forfar to Dundee. The burgh consists of two principal and several minor streets, and though irregularly built has greatly improved in its external appearance of late years by the erection of new buildings both public and private. The public buildings include, besides churches and schools, a town-house, new county buildings, a handsome public hall the gift of one of the townsmen, a poorhouse, and an infirmary. Some of the offices occupied by the banks are handsome buildings, as are one or two of the linen factories. There is a well laid out cemetery and a commodious railway station. Among the educational institutions there are an academy for secondary education and four large burgh schools. The staple manufacture is linen, especially of the coarser varieties, there being several large factories in the town, in connection with which are several bleach-works. Forfar belongs to the Montrose district of burghs, which together send one member to Parliament. Pop. in 1891, 12,818; in 1901, 12,061.

FORFEITURE, in law, the effect of a transgression or offence, as the loss of privilege, right, estate, honour, office, or effects, either in *civil* or *criminal* cases. In *civil* cases, as when a tenant in tail makes leases not warranted by the statute, a forfeiture is committed, and he who has the immediate reversion may enter upon possession. In *criminal* cases it is twofold: of real and personal estates, as by attainder in high treason; or in petty treason and felony, of all chattel interests absolutely, and the profits of all freehold estate during life and after death, of all lands and tenements in fee simple (but not those in tail) to the crown for a year and a day, &c. Lands are forfeited upon attainder, and not before; goods and chattels are forfeited by conviction. By 33 and 34 Vict. cap. xxiii. it has been enacted that no conviction for treason or felony shall cause attainder or corruption of blood, or any forfeiture or escheat, provided that nothing in this act shall affect the law of forfeiture consequent on outlawry.

FORGE is the name either of the furnace at which wrought iron is hammered and fashioned, called a smith's forge, or of the workshop in which iron is made malleable, also called a shingling-mill. A forge requires a furnace, an anvil, and a bellows, but all

these requisites differ according to the nature of the work to be performed. A common smith's forge is blown with an ordinary bellows wrought with the hand; where the forges are numerous or large more powerful apparatus for blowing them is required. The appliances required for the anvils in modern forging includes moulds and machinery of all kinds, for forging articles the most various in size and design. In the forging of heavy work the steam-hammer is freely used, and corresponding moulds and matrices are fixed in the anvil and the hammer. In cutlery and other finer processes of manufacture the lightest and most delicate work is performed by appropriate machinery placed on the anvil of the forge. Air-furnaces and open fires of various kinds are used in forging according to the nature of the work. See ANVIL, BELLOW, BLOWING-MACHINE, IRON, &c.

FORGERY has been defined as the fraudulent making or alteration of a writing to the prejudice of another man's rights, or making, *malò animo*, of any written instrument for the purpose of fraud and deceit; the word *making*, in this last definition, being considered as including every alteration of or addition to a true instrument. Forgery at common law was of the degree only of a misdemeanour, but latterly it was specially subjected to punishment by statutes. The offence of forgery may be complete though there be no publication or uttering of the forged instrument; for the very making with a fraudulent intention, and without lawful authority, of any instrument which, at common law or by statute, is the subject of forgery, is of itself a sufficient completion of the offence before publication. Most of the statutes, however, which relate to forgery make the publication of the forged instrument, with knowledge of the fact, a substantive offence. It is said by Hawkins that the notion of forgery does not seem to consist in the counterfeiting of a man's hand and seal, which may often be done innocently, but in endeavouring to give an appearance of truth to a mere deceit and falsity, and either to impose that upon the world as the solemn act of another, which he is in no way privy to, or at least to make a man's own act appear to have been done at a time when it was not done, and, by force of such a falsity, to give it an operation which, in truth and justice, it ought not to have. A deed forged in the name of a person who never had existence is forgery at law, as was determined in Bolland's case. A writing is forged where one, being directed to draw up a will for a sick person, doth insert some legacies therein falsely out of his own head. It is not material whether a forged instrument be drawn in such manner that if it were in truth that which it counterfeits it would be valid. The punishment of forgery at common law was, as for a misdemeanour, by fine, imprisonment, and such other corporeal punishment as the court in its discretion might award. The punishments ordained for the offence by the statute law in England were once, with scarcely an exception, capital. Capital punishment for forgery was abolished by act 2 and 3 William IV. cap. cxxiii., 1832, and 24 and 25 Vict. cap. xcv., 1861. The law relating to forgery is now regulated by the Criminal Law Consolidation Act, 24 and 25 Vict. cap. xciv. to c., 1861, amended by 33 and 34 Vict. cap. lviii., 9th Aug. 1870. The punishment for forgery varies from penal servitude for life, or not less than five years, to imprisonment for not more than two years. Forgery of telegrams and forgery of trade-marks are dealt with in distinct statutes.

FORGET-ME-NOT (*Myosotis palustris*), a small herbaceous plant of the natural order Boraginaceae, common in wet places throughout all Europe and

naturalized in parts of North America. The root is perennial; the stem about 1 foot high, bearing small yellow-centred blue flowers in a cincinnate one-sided raceme, formerly called a scorpioid cyme. The leaves are alternate, the calyx gamosepalous and five-toothed with appressed hairs, the corolla gamopetalous with a short straight tube closed by five small scales and a spreading five-lobed limb, the stamens five in number, and the fruit consists of four shining one-seeded nutlets. The brilliancy of the flowers renders them conspicuous notwithstanding their diminutive size, and it is considered the emblem of friendship among most of the nations of Europe, probably owing to its clear blue, the colour of fidelity. The name forget-me-not is often extended to the other species of the genus, which are also known by the names of *mouse-ear* and *scorpion-grass*. Among British forms are the large-flowered *M. sylvatica*, or wood forget-me-not; the small and very common *M. versicolor*, whose flowers show an interesting colour-change; *M. cæspitosa*, by some regarded as a variety of *M. palustris*; *M. arvensis*, the commonest species; &c. The name forget-me-not was formerly applied to *Ajuga Chamæpitys*, a species of the bugle genus, and in some places *Veronica Chamædrys*, the germander speedwell, is also known by this name.

FORK. Table-forks are first mentioned in an inventory of a prince's plate in 1379. Before this period the knife alone was used for the purpose of cutting up food. The use of the fork spread from Italy to the northern parts of Europe. Thomas Coryate, a traveller who visited Italy in 1608, is said to have introduced it into England; and James I. was the first sovereign of England who is known to have had a fork. The use of the fork was considered so great a luxury, that many monastic orders forbade their members to indulge in it. The Asiatics, even to this day, use no forks, as is also the case with the Turks. The Chinese, instead of forks, make use of two small sticks (see CHOPSTICKS), which they hold in the same hand between different fingers.

FORLÌ (ancient *Forum Livii*), a town of Italy, capital of a province of the same name, 38 miles south-east of Bologna, on the railway to Ancona, in a pleasant and fertile plain watered by the Ronco and Montone. It is handsome and well built, with two or three spacious squares, and contains many beautiful buildings, including several palaces, a public library (80,000 vols.), a hospital, &c. It has a cathedral and several other churches, most of which are adorned with fine paintings by Palmezzano, Guido, and other masters. Forlì has a good municipal picture-gallery. There are manufactures of silk, oil-cloth, woollen stuffs, wax, nitre, and refined sulphur; and a considerable trade in corn, wine, oil, hemp, and aniseed. Pop. (1896), with suburbs, 46,700.—The province of Forlì is bounded n. by the province of Ravenna; w. by Florence; s. by Urbino e Pesaro and the small republic San Marino; and e. the Adriatic; area, 725 square miles. The surface in the west is rather elevated, being partially formed by low branches of the Apennines, but elsewhere becomes flat, particularly in the north towards the coast, where extensive swamps prevail, and make the air very unhealthy. Wheat, maize, hemp, the vine, olive, and various fruits are cultivated, and the silkworm is reared. Pop. (1898), 282,160.

FORLORN HOPE, a body of men, usually volunteers, who undertake the assault on a fortress, or some other dangerous enterprise. The corresponding French term is *enfants perdus*.

FORMA PAUPERIS (IN). By the laws both of England and Scotland provision is made for suits being carried on by individuals who are too poor to

pay the usual fees. A suit conducted under these provisions is said to be a suit in *forma pauperis*.

In England, by the statutes 11 Henry VII. cap. xii., and 28 Henry VIII. cap. xv., it is provided that any one taking oath that he is not worth £5 beyond his wearing-apparel and the subject in dispute, is entitled to have writs, according to the nature of the case, without paying fees, and the judges may assign him counsel and attorney who shall act gratuitously. This indulgence is granted to plaintiffs only at common law, and is granted to defendants only in prosecutions. A plaintiff must have a counsel's certificate of a good cause of action, and an affidavit of the party or his attorney must be laid before court that the case contains a full and true statement of material facts. A person admitted to sue in *forma pauperis* is not entitled to costs from the opposite party, unless by order of the court or of a judge.

In Scotland similar provision was made for the poor by statute 1424, cap. xiv. The practice is to form a roll of litigants entitled to sue in *forma pauperis*, to which applicants are admitted by the court, on being satisfied of their poverty and of their possessing *probabilis causa litigandi*. In Edinburgh the Faculty of Advocates appoint six of their number annually to be advocates for the poor, and the writers to the signet and agents and solicitors respectively appoint four of their number annually to be agents for the poor. A list of these appointments is given in to both divisions of the Court of Session. Agents for the poor are also appointed before the sheriff courts. The applicant for admission to the poor-roll must produce a certificate from the minister and two elders of the parish in which he resides setting forth his circumstances according to a prescribed formula. Ten days' previous notice must be given to the adverse party of the time and place fixed for making the declaration before the minister and elders.

FORMATION, GEOLOGICAL. By this are meant mineral beds or strata, differing essentially from those lying beneath and above, both in their aspect, mineral constituents, and fossil contents, and supposed to have been deposited under the same cosmical conditions, and hence regarded as representing a distinct period in the succession of changes which have passed over the earth's surface. In most of the formations there are some mineral and fossil affinities; and in many, even where the external differences are apparently complete, there are some common characters, by the aid of which a passage from the one to the other can be traced. Thus the chalk differs essentially, both from the green sand which lies beneath it, and the plastic clay which lies above it, in its aspect, its mineral constituents, and many of its fossil contents. Yet the green sand passes into the chalk marl, and this last into the chalk. Their common characters are almost obvious enough to warrant our classing all the beds of chalk and green sand in one formation, did not the cretaceous and flinty characters of the first distinguish it in a marked manner from all the rest.

A *formation* properly means an assemblage of beds, distinct from each other, but lying in a group in a determinate order, the whole having a common character or affinity, and being constantly found in a particular part of the geological series, overlying another formation distinct from itself. The oolitic series is an assemblage of this kind, having a common oolitic character, from the lias to the Portland oolite inclusive, notwithstanding the important deposits of Kimmeridge clay, Oxford clay, &c. &c., which occasionally separate the calcareous beds. The coal formation, also, which is a series of alternate beds of coal, shale, sandstone, and limestone, is illustrative of the nature of a formation. Coal,

moreover, is occasionally found in the inferior deposits of the millstone grit, the carboniferous limestone, &c., and under circumstances that warrant our classing them all in one group, as has been done with the oolitic series, from the prevalence of the oolitic character. Coal is only worked profitably in beds above the carboniferous limestone, and hence the term *coal formation* is sometimes, though not with strict propriety, confined to strata in which workable seams of coal usually occur. In the same way, also, we speak of the *coal measures*.

The unvarying succession of formations to each other in the geological series has been found to exist in parts of the earth widely separated from each other, and warrants not only the belief that they have come into their order successively, but that the causes which brought each formation to its place were of one class, and operated simultaneously. When we consider the invariable succession in all the observed parts of our planet, exemplified in the different formations, we cannot but look to a regular succession of causes for the production of these uniform results. And although the order and continuity of the series are much interrupted occasionally, it is less difficult to believe that particular circumstances have interrupted such succession and continuity than that they have not existed. See **GEOLOGY**.

FORMENTERA. See **BALNEARES**.

FORMICA. See **ANT**.

FORMIC ACID (HCO₂H). When an ant (*Formica rufa*) is allowed to run over a piece of blue litmus paper it leaves a red track, showing that an acid fluid is secreted by it. If a quantity of the insects be pressed and distilled with water a mixed oily and aqueous fluid, with a very acid reaction, comes over. By neutralizing with potassic or sodic carbonate, heating to remove the oil and water, and then decomposing the residue with sulphuric acid, the acid of the ants—hence called formic acid—may be distilled off. It was first obtained by John Wray, who, in his account of it in 1670, compares it with acetic acid, and mentions its compounds with lead and iron. Afterwards it was frequently examined by the eighteenth-century chemists, by Marggraf, Homberg, and Scheele, and especially among modern chemists by Berzelius and Liebig, and its preparation by a great variety of reactions, from a multitude of substances, has been described. When its simple composition is considered it is not difficult to see how it should result from a number of decompositions, because it is one of the last stages in the oxidation of organic substances, as it only wants an additional proportion of oxygen to be converted into carbonic anhydride and water.

Formic acid exists not only in ants but in the blood, urine, and flesh-juice of animals; in the stinging-nettle, in fir-tree needles, tamarinds, and in some mineral waters. It is, however, usually prepared by the oxidation of organic matter, such as sugar, starch, woody fibre, alcohol, tartaric, oxalic, and other acids, by means of sulphuric, nitric, chromic, or permanganic acid, by a mixture of oxide of manganese and sulphuric acid, of lime and bleaching-powder, and by many other processes. One of the best consists in heat^g oxalic acid and glycerin. So long as it was obtained merely from the substances mentioned it was naturally supposed to be either itself a product of life, or to be derivable from substances similarly produced. This, however, is now known to be inaccurate, for formic acid can be obtained synthetically by a variety of reactions. The most direct consists in keeping carbonic oxide gas (CO) in contact with aqueous or alcoholic potash. The gas is gradually absorbed, and potassic formate (KCO₂K) is the result. On distilling this salt with dilute sulphuric acid the acid is

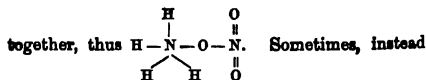
separated. Pure formic acid, at ordinary temperatures, is a colourless, transparent, fuming fluid, caustic and pungent, of sp. gr. 1.22, which boils about 212° Fahr., evolving an inflammable vapour. Below 82° Fahr. it solidifies to shining plates. It mixes with water and with alcohol in all proportions; the solution has a pungent odour and sour taste, and strong acid reaction. It is decomposed by a number of reagents, such as sulphuric acid or nitric acid, or chlorine, with evolution of carbonic oxide or carbonic acid gas. Formic acid is the lowest member of the series of fatty acids (which see); it is monobasic, but it forms both acid and double salts. It combines with the metals, and reacts with the metallic oxides or carbonates to form the large class of salts called *formates*; but in certain cases, for instance with salts of silver, platinum, or mercury, it acts the part of a reducing agent, and throws down the elements in the metallic state. In this way it is distinguished from acetic acid. It also forms a series of compound ethers or ethereal salts, by combining with methyl, ethyl, amyl, and other alcoholic radicles.

FORMOSA, known to the Japanese and Chinese as TAI-WAN, an island in the Chinese Sea belonging to Japan, separated from the Chinese province Fokien by the Fo-kien Strait or Formosa Channel, which is about 80 miles wide where narrowest. The island is about 240 miles in length and 90 in breadth at the widest part. Its area is estimated at about 15,000 square miles, or half that of Scotland. It is traversed from north to south by a range of mountains having a mean elevation of 10,000 feet, west of which are extensive and fertile plains, while the mountains sink steeply to the sea on the east side. The chief summits of this range are Mounts Sylvia (11,300 feet), Tashan (12,000), Morrison (14,350), and a peak near Sylvia with a height of 12,800 feet. Some parts of the island show signs of volcanic activity, and geysers are found on the Tamsui river in the north. Mud-banks deposited by the action of rivers skirt the west coast, where the land is gaining rapidly on the sea. The most important river is the Tamsui, but its mouth is obstructed by a sand-bar. The flora is very rich and beautiful, being more tropical than that of China. Among the more characteristic animals are several species of bats, an ape, moles, flying-squirrels, wild swine, peculiar stags, and pangolins. The chief minerals of the island are coal, which is not as yet extensively worked; sulphur, petroleum, and a little gold. The soil is exceedingly fertile, especially on the west side, and produces in abundance rice, sweet-potatoes, grain, fruits, tea, tobacco, sugar, pepper, &c. Railways have been constructed from Kelung on the north coast southwards, and from Takow on the south-west coast northwards, as portions of a trunk line running along the west side of the island. Communication by telegraph and road is also being extended, and harbour improvements carried out. The chief exports are tea, sugar, camphor, coal, turmeric, and fibres; and the imports include pigs, cottons, opium, silks, kerosene oil, flour, rice, &c. The best harbour is that of Kelung; and the other ports include Tamsui, Takow, Tai-nan, and An-ping (the last two connected by a canal 3 miles long). In the mountainous districts there are uncivilized aborigines of Malay stock, who tattoo the face and practise head-hunting; but the great majority of the inhabitants are Chinese, there being also a considerable number of Japanese. In 1874 the Japanese invaded the island, on account of cruelties perpetrated on shipwrecked Japanese, and afterwards withdrew, and in 1884 the French temporarily occupied Kelung. As a result of the war in 1894-95 between China and Japan the island was ceded to and occupied by the latter power. The capital is

Tai-peh, near the northern extremity, not far from Tamsui and Kelung. Pop. estimated at 3,000,000.

FORMS OF ADDRESS. See ADDRESS.

FORMULA, in chemistry, a collection of symbols expressing the composition of a compound. The device appears to have been first employed by T. Thomson to express the composition of minerals, but it was further developed by Berzelius after it was put beyond a doubt that a chemical compound always contains the same elements combined in definite proportion. Formulae are of various kinds, according to the ideas they are meant to express. Suppose a body has been analysed and found to consist, say, of 85% of nitrogen, of 5 of hydrogen, and 60 of oxygen; it is next calculated what amount of the combining proportions of each of the elements is represented by these numbers, and this is found to be two combining proportions of nitrogen, four of hydrogen, and three of oxygen, or in symbols $N_2H_4O_3$. Such a formula, expressing merely the proportional composition, is called an *empirical* formula. The study of the properties of this body, the way in which it can be formed, its behaviour when heated, or acted on with acids or alkalies, or in other ways, leads to the conclusion that it is a compound of ammonia and nitric acid, and hence the symbols are usually arranged to denote this, its formula being accordingly NH_4NO_3 or NH_4HNO_3 . Such a formula is called *rational*, because it denotes the proximate composition of the body. It so happens, however, that this substance can undergo decomposition in a way which would never indicate that ammonia or nitric acid could be got from it, for, when heated, it breaks up into water and nitrous oxide, and there might be therefore used a rational formula for this view of its composition, such as $N_2O_4.2H_2O$. The rational formula, in short, may vary with the decompositions of the substance, though practically one formula is adhered to for each substance. Formulae based on gaseous volume and atomicity attempt not merely to exhibit one or more reactions or decompositions of the body, but how the 'atoms'—that is, the combining proportion units—are actually combined with each other. Thus the ammoniac nitrate already given is written $NO_2(NH_4O)$. This is called a *constitutional* formula. A *graphic* formula is a mere expansion of this to show by a picture how the elements are joined



of letters, diagrams have been used. Besides the above there are *typical* formulae, representing the constitution of bodies upon the assumption that certain simple bodies—hydrochloric acid, water, ammonia, marsh-gas—are types after which other bodies are constructed. *Molecular* formulae are those which represent the amount of a substance which, in the state of vapour, would normally occupy the space filled by two combining proportions of hydrogen at a given temperature and pressure. Thus, ferric chloride has the molecular formula Fe_2Cl_6 , whereas the empirical formula, which expresses merely the simplest results of an analysis, is $FeCl_3$.

FORRES, the name of a royal and parl. burgh of Scotland, in the county of Elgin, 25 miles N.E. Inverness, beautifully situated on a dry sandy knoll. Forres is a clean, well-paved little town, and contains some good buildings, among which may be mentioned the town-house, and Anderson's Academical Institution. Shakspeare has immortalised Forres by making it the scene of the chief events in his tragedy

of Macbeth. The site of the old castle where Duncan was killed is at the western side of the town, and the heath, 4 miles to the west, is still 'blasted', being one of the most sterile moors in Scotland. Close by the town is a remarkable obelisk 23 feet high, 8 feet 10 inches broad, and 1 foot 3 inches thick, called Sweno's Stone. There is a hydro-pathic on the slope of the Cluny hills. Forres is one of the Inverness district of parliamentary burghs. Pop. in 1881, 4080; in 1891, 3971; in 1901, 4318.

FORSKAL, PETER, a Swedish botanist, and pupil of Linnæus, was born in 1736, and studied at Göttingen, where he defended, in 1756, a thesis—*Dubia de Principiis Philosophiæ recentioris*. In 1761 he was appointed professor of natural history in Copenhagen, and the same year, on the recommendation of Linnæus, he was selected by Frederick V. to join the scientific expedition to Arabia, to take charge of the department of natural history. He set out on this expedition with Niebuhr, Von Haven, and Kramer, and collected plants in the environs of Marseilles, of which he published a *Flora* at Malta. He arrived in Egypt and Arabia, where he collected plants with the greatest zeal; but being attacked by the plague, he died in 1763 at Djerin, in the latter country, too early for science. Niebuhr collected Forskal's papers, which consisted merely of detached sheets, accompanied them with remarks, and published them under the titles *Descriptiones Animalium, Avium, Amphibiorum, Piscium, Insectorum*, quas in Itinere Orientali observavit P. Forskal (Copenhagen, 1775, with an engraving); *Flora Ægyptiaco-Arabica*, &c. (ibid.); *Icones Rerum Naturalium*, quas in Itinere Orientali depingi curavit Forskal (ibid. 1776, with forty-six engravings, of which twenty represent plants and twenty-three animals).

FORSTER, JOHANN GEORG ADAM, was born in 1754, at Nassenhuben, near Dantzig. He accompanied his father at the age of eleven years to Saratov, and continued in St. Petersburg the studies which he had begun under his father's direction. When his father went to England he was placed with a merchant in London; but his feeble health soon compelled him to give up mercantile pursuits. In company with his father he performed the voyage round the world with Cook, 1772-75. In 1777 he went to Paris with the intention of settling there, but soon after went to Holland, and was on his way to Berlin when the landgrave of Hesse offered him the chair of natural history in an academy in Cassel. He held that office till 1784, when he accepted an invitation to become professor of natural history at Wilna. Here he received the degree of Doctor of Medicine. In 1788 the elector of Mainz appointed him his first librarian. Forster occupied this post with great reputation, till the French entered the city in 1792. He had warmly embraced revolutionary principles, and was sent to Paris, by the republicans of Mainz, to request a union with France.

While absent on this commission the Prussians recovered the city. By this event he lost all his property, with his books and papers. Owing to this and other misfortunes his health was affected, and he died at Paris in 1794. Forster is considered by the Germans one of their classical writers. His translations are numerous. The excellent account of Cook's second voyage round the world he wrote in connection with his father. He also wrote *Essays on Geography, Natural History, Practical Philosophy*, six vols., and excellent *Views of the Lower Rhine, Brabant, Flanders, Holland, England, and France*, in 1790, three volumes.

FORSTER, JOHANN REINHOLD, professor of natural history at Halle, in Prussia, was born at Dirschau, October 22, 1729. His father was burgo-

master of Dirschau, a town not far from Dantzig. In 1748 he began to study theology at Halle; and in 1751 he went to Dantzig and obtained the place of preacher at Nassenhuben or Nassenhof. He gave just so much attention to his office as necessity required, and entered with his whole soul into his favourite studies—mathematics, philosophy, history, geography, and the ancient languages. His passion for travelling was gratified by a commission to examine the state of the colony of Saratov, in Asiatic Russia, for which he set out in March, 1765. His official report gave much satisfaction, but he was not rewarded as he had expected; and having lost the place of preacher by his long absence, he went to London in August, 1766. Here he supported himself and his son Georg partly by the sale of the curiosities which he had collected in his travels, and partly by translations. He afterwards joined a Dissenting academy at Warrington, in Lancashire, as teacher. He was finally invited to accompany Captain Cook in his second voyage of discovery as naturalist of the expedition. He set out from London, June 26, 1772, with his son, at that time seventeen years old. This voyage, which lasted three years, is minutely described in a work bearing the name of his son Johann Georg Forster (London, 1777, two vols. 4to), and the father afterwards published his valuable remarks on the physical geography, the natural history, and the moral and intellectual condition of the countries he had visited (London, 1778, 4to). In 1780 he was invited to Halle, as professor of natural history, and continued an ornament of the university until his death, eighteen years afterwards. At Halle he wrote many valuable works, and translated the latest voyages, among which was the third voyage of Cook. He died December 9, 1798. Of his numerous writings, the best are his *Observations on a Voyage round the World*, already mentioned, his *History of Voyages and Discoveries in the North*, and his *Antiquarian Researches on the Byssus of the Ancients*.

FORSTER, WILLIAM EDWARD, an English statesman, born at Bradpole, Dorset, July 11, 1818, and died April 6, 1886. The son of a minister of the Society of Friends, he was educated at the Friends' school at Tottenham, and afterwards accepted an appointment in the woollen trade in Bradford. During the Irish famine of 1845 he visited the distressed districts, where he distributed the relief fund raised by the Society of Friends. In 1850 he married the eldest daughter of Dr. Arnold of Rugby. In an effort to enter parliament he contested Leeds in 1859 unsuccessfully, but in 1861 he was returned unopposed for Bradford. In 1865 he became under-secretary for the colonies; in 1868 he was appointed vice-president of the council on education and a privy-councillor; while in 1870 he accepted a seat in Mr. Gladstone's cabinet, and carried through parliament the Elementary Education Bill (1870) and the Ballot Bill (1872). In November 1875 he was elected lord rector of Aberdeen University. When the Liberals again returned to power in 1880 he accepted the post of chief-secretary for Ireland at a time when that country was distracted by political and agrarian tumults. To mitigate the severity of the numerous evictions he introduced a Compensation for Disturbance Bill (1880), which was rejected by the House of Lords. The following year he introduced a Land Bill and a Coercion Bill, both of which were passed, and in order to check the growing power of the Land League he declared that organization illegal, and imprisoned Mr. Parnell and other members of his party. In April, 1882, the government resolved to release the Parnellites and adopt a more conciliatory policy, whereupon Mr. Forster resigned his office.

Subsequently he was often found acting in opposition to the government, chiefly in reference to foreign affairs, and he was also opposed to a separate Irish parliament in Dublin. His opinion on the latter question carried great weight because of his well-known sympathy for Ireland, his abilities as a statesman, his experience in affairs, and his unquestioned honesty. The *Life of Forster*, in two vols., was published by Wemyss Reid in 1888.

FORT, a small fortified place surrounded with a ditch, rampart, and parapet, for the purpose of defending a pass, river, road, harbour, &c. Forts are made of different forms and extent according to the exigencies of the case.

FORT-AUGUSTUS, a village, Scotland, county of Inverness, about 33 miles south-west of the town of that name, and situated on the Caledonian Canal. It has an Established, Free, and Roman Catholic churches, and a public school. Pop. 611. It has its name from a fort erected in the vicinity in 1734 to overawe the Highlanders, who, however, succeeded in capturing it in 1745. It was purchased by Lord Lovat in 1876, and now forms the site of a Roman Catholic college, monastery, hospitium, and church, opened in August, 1880.

FORT DE FRANCE, or **FORT-ROYAL**, a town and seaport, French West Indies, island of Martinique, of which it is the capital; situated on the north side of a deep and well-sheltered bay protected by a fort. The principal buildings are the parish church, government offices, the barracks, arsenal, prison, and hospital. From its situation on the west side of the island the bay is protected from the prevalent winds, and in one part or another will be found suitable for all circumstances. Fort-Royal is the residence of the French governor. Pop. 11,424.

FORT-GEORGE, a fortress, Scotland, county of and 10 miles north-east of Inverness, at the extremity of a low point of land projecting into the Moray Firth. It is an irregular polygon, with six bastions, and has accommodation for 2090 men besides officers. It was built after the rebellion of 1746, for the purpose of keeping the Highlanders in subjection. It occupies 15 acres, but is secure from attacks by sea only, being commanded by some adjoining heights.

FORTH, a large river of Scotland, is formed by the junction of two streams, the Duchray and the Dhu: the one rising in Stirlingshire, the other in Perthshire, at the distance of a few miles from each other, and both on the north-east side of Ben Lomond. The junction takes place at Aberfoyle, from which the river flows south-east, and after a winding course of about 170 miles, discharges itself into the German Ocean, having previously expanded into a broad estuary called the Firth of Forth. It forms, for a considerable part of its course, the boundary between the counties of Stirling and Perth. For the greater part of its course it flows through a rich, flat country, and is navigable for vessels of 300 tons as far as Alloa, and for those of 70 tons to Stirling. Its most remarkable windings, called the Links of Forth, occur between the latter places, the distance between Stirling Bridge and Alloa being but 6 miles by land, while by water it is 12. These windings form a great number of beautiful peninsulas. For several miles above and below Clackmannan the tides of the Forth exhibit a singular phenomenon, called by seamen 'leaky tides.' When the water has flowed for three hours it runs back for about an hour and a half, nearly as far as when it began to flow. It returns immediately, and flows during another hour and a half to the same height it was before; and this change takes place both in the flood and ebb tides. The Forth is a good salmon stream, and its estuary contains great variety and considerable abundance

of fish, particularly white-fish and herrings, which frequent it in shoals; oysters are also obtained. The principal tributaries are the Teith and Allan, above Stirling Bridge, and below it the Devon, Carron, Avon, Almond, Leith, Eak, and Leven; these chiefly flow into it on the south shore. There are several islands in the river. Lighthouses are erected on two of them, the Isle of May and Inchkeith; and the ruins of castles or religious houses appear on all the different islands.

FORTH BRIDGE, the largest structure of its kind in the world, is a railway viaduct which crosses the Firth of Forth at Queensferry, here about 4000 feet wide at low water. The Firth, at this point, is divided into two channels by the island of Inchgarvie, situated about midway across. Upon this island the central pier of the bridge is built, while there is also a pier upon each shore. On the top of each of these main piers three double lattice-work cantilevers are poised, extending towards each other and towards the shore upon each side. The two chief spans, which are each 1710 feet wide, are made by these cantilevers, the extremities of which are connected by girders. Besides these two main spans there are other two of 680 feet each, fifteen of 168 feet each, and seven small arches which are about 400 feet wide. The total length of the bridge, including the width of the piers and the viaduct approaches, is about a mile and a half. The clear headway under the centre of the bridge is 150 feet above high water, while the highest part of the structure is 361 feet above high water. Each of the three main piers upon which the bridge rests consists of a group of four cylindrical granite and concrete piers 49 feet in diameter at the top and from 60 to 70 feet at bottom. The deepest pier is about 70 feet below low water, and the rise of the tide is 18 feet at ordinary springs. In the piers there are about 120,000 cubic yards of masonry, and in the superstructure about 45,000 tons of steel. All the foundations of the piers are either upon rock or on boulder clay; the whole structure is so braced as to be capable of resisting any probable stress in any possible direction; and the whole superstructure is bolted down to each column by forty-eight steel bolts 2½ inches in diameter and 24 feet long. A double line of rails is carried upon an internal viaduct supported by cross girders and tressels. This immense undertaking, which was projected and begun in 1883 by a company in which the North British, Great Northern, North-Eastern, and Midland Railways are interested, was successfully finished and the bridge opened for traffic in May, 1890. The engineers who designed the bridge were Sir John Fowler, Bart., and Sir Benjamin Baker, while the contract-work, which was let for £1,600,000, was carried out by Sir William Arrol and his firm. See plate at BRIDGE.

FORTIFICATION, the science of strengthening positions in such a way that they may be defended by a body of men much inferior in number to those by whom they are attacked; and more particularly, the science of strengthening positions so as that they may be held against the assault of troops supported by artillery. The first species of fortification was, of course, very simple, consisting merely of a rampart or wall of earth or stones or of a fence of palisades. A ditch was added to the wall; round or square towers were then introduced, placed at such intervals as to be capable of affording assistance to one another. This was the whole art of fortification practised by the ancients. With the introduction of artillery in sieges the art of fortification underwent a great change. The first modification was an increase in the thickness of the walls, and in the diameter of the towers, at the expense of their

height. These towers were now called roundels, and made large enough to accommodate several pieces of cannon. To enable the besieged to work cannon on the wall a rampart of earth was thrown up behind it so as to give the necessary width; and this earthwork gradually encroached on the wall, in some cases entirely superseding it. This system was developed by Albrecht Dürer, the painter, who may be said to form the connecting link between the ancient and modern styles. It was soon found, however, that the round shape of the tower had the serious disadvantage that neither the curtain (the portion of wall between two towers) nor the next adjoining towers could reach with their fire every point in front of an intermediate tower; there were small angles close to the wall where the assailants would be in complete shelter. To obviate this the tower was changed into an irregular pentagon, with four sides towards the open and one towards the interior. This pentagon was called a bastion. The time of the invention of bastions is not precisely ascertained, nor is it known with any degree of certainty who was the inventor of this development of fortification. It is certain, however, that they were in use in 1500. Fortifications are divided into regular and irregular, permanent and temporary. In regular fortifications the bastions are all equal, and form regular figures, mostly equiangular and equilateral polygons. In irregular fortifications only the corresponding sides and angles are equal. These are most common, as the inequalities in the ground seldom admit of regular fortification. The regular fortifications are, however, much to be preferred, as they offer equal resistance on all sides, and expose no weak points of which the enemy can take advantage. Permanent fortifications are works required to remain effective for any length of time, for the purpose of defending important positions and cities, dockyards, arsenals, &c. Temporary fortifications consist usually of field-works, &c.

The more important details of a regular fortification may be briefly described as under. Around the place to be defended is raised a mound or bank of earth called a *rampart*, on the upper surface of which (the *terre-pleine*) the troops and cannon are placed. The *terre-pleine* is covered from the enemy's fire by a breast-work or *parapet*, about 8 feet high, pierced at certain intervals with *embrasures* through which the guns are fired. The angle formed by the *terre-pleine* and the inside face of the parapet is filled by a *banquette* or step on which the infantry mount to deliver their fire. Immediately beyond the rampart is the main ditch, usually about 12 feet in depth, but varying greatly in width. The ditch is sometimes filled with water, in other cases it is dry. The *escarp* or *scarp* is the inner wall of the ditch, and it is faced with mason-work (the *revêtement*) to retain the earth of the rampart in its place. The *counterscarp* is the opposite or outer wall of the ditch. From the top of the counterscarp outwards is a space about 30 feet wide (the *covered-way*) protected by a parapet, the long superior outward slope of which forms the *glacis*. The use of the covered-way is to allow the troops to be drawn up on it unseen by the besiegers for the purpose of making a sortie; it also enables the defenders to keep up a closer fire on the attacking forces. The slope of the glacis is so constructed as to bring the assailants in the direct line of fire from the guns and musketry on the ramparts, and the advance over it may be further checked by abatis, palisades, or other obstacles. Defensive works outside the ditch but within the glacis are called *outworks*, the chief form of which is the *ravelin*. *Retrenchments* are additional works thrown up to strengthen such parts as are weak or much exposed,

and behind which the garrison may maintain the defence when driven from an outer line. For further particulars on the defensive works of fortifications see the articles *BASTION*, *CAVALIER*, *Demi-Lune*, *HORN-WORK*, *RAVELIN*, &c.

The systems of bastionary fortification are classed under several national schools, the first in point of date being the Italian. The first Italian bastions were little else than polygonal towers or roundels; they scarcely altered the former character of the fortification, except as regards the flanking fire. The enceinte or main wall was still of masonry, exposed to the direct fire of the enemy, the rampart of earth behind it served chiefly to give room to handle the artillery, and its inner slope was also faced with masonry. The curtains were very long, from 300 to 500 yards, and the bastions very small, the flanks always perpendicular to the curtains, and meant to cover the long line of curtain alone. Sometimes a platform or flat obtuse-angled bastion was constructed in the middle of the curtain when it became too long. There were, as yet, no ravelins, no tenailles, no covered-way, no glacis. But the system was soon improved. The curtains were shortened, the bastions were enlarged. The ditch was made very wide and deep, and the covered-way was introduced. It served as a place of concentration as well as retreat for rallying parties. The gates were in the middle of the curtain; to cover them a crescent-shaped work was placed in the middle of the ditch in front of them; but for the same reason that the towers were transformed into bastions, the half-moon (*demi-lune*) was changed into a triangular work—the present ravelin. This was at first small, but soon became larger, when it was found that it not only served as a bridge-head across the ditch, but also covered flanks and curtains against the enemy's fire, gave a cross fire in front of the capital (most advanced angle) of the bastions, and effectually flanked the covered-way. The first to point out the defects in the Italian system was a German engineer named Franz, who fortified Antwerp for Charles V. He was followed by Daniel Speckle, who broke completely through the fetters of the old school, and laid down the principles on which the whole of the subsequent systems are founded. His practical skill was shown in the construction of the fortresses of Ingolstadt, Haguenau, Ulm, Culmar, Basle, and Strasburg. The great engineer Vauban, who served under Louis XIV., may be said to have made the French school the first in Europe. Not that there was anything original in his system, as he borrowed his best ideas from Speckle, and a countryman of his own named Pagan. But the arrangement of the details, the proportions of the lines, the profile, and the adaptation of the theory to the ever-varying requirements of the locality, are so ingenious that they appear perfection when compared with the works of his predecessors, so that scientific and systematic fortification may be said to commence with him. His great rival, Coehorn, skillfully developed the system of the old Dutch school with its low ramparts, without masonry revetments, broad and shallow water ditches, numerous outworks in the ditch, and the plan of laying the country outside the glacis under water. The modern system of protecting large fortresses may be said to be due to the genius of Montalembert (1718-99), a French major-general. It consists of surrounding the place by a single or double chain of small forts on commanding elevations, which, though apparently isolated, still support each other by their fire, and by the facility which they give for powerful sorties render a bombardment of the place almost impossible, and when required form an entrenched camp for an army. The largest fortress constructed on this

system is Paris; it has a simple bastioned enceinte, about 25 miles long, with two lines of detached forts, the second line being constructed since the Franco-German war. The superiority of the modern system of defence, as against modern means of attack, was fully demonstrated in the Franco-German war; yet the capture of Paris by the Germans in the beginning of 1871 forms a striking illustration of the rule, that the reduction of a fortress is simply a question of time.

Field Fortification.—The construction of field works is as ancient as the existence of armies. The Roman legions in presence of an enemy entrenched their camp every night. During the seventeenth and eighteenth centuries field-works played an important part in several campaigns, and in the wars of Frederick the Great pickets on outpost duty generally threw up slightly profiled redans. Yet even then, and it is still more the case now, the construction of field-works was confined to the strengthening of a few positions selected beforehand, with a view to certain eventualities during a campaign, such as Frederick's camp at Bunzelwitz, and Wellington's lines at Torres Vedras. Formerly entrenched lines were continuous; but from the defect that if taken at one point the whole line was useless, they now universally consist of one or more lines of detached redoubts, flanking each other by their fire, and allowing the army to fall on the enemy through the intervals as soon as the fire of the redoubts has decreased the energy of his assault. This is the principal function of field-works, but they are also employed singly to defend the access to a bridge or to close an important pass. The more important works of this nature are the redan, which consists of two parapets, with a ditch in front, forming an angle facing the enemy; or lunettes, which are redans with short flanks. The chief closed field-work now in use is the redoubt, either as a regular or irregular quadrangle, closed by a ditch and parapet all round. The parapet is made as high as in permanent fortification, but not so thick. As none of those works has a flanking fire in itself, they have to be disposed so that they flank each other within musket range. To do this, actually, and to strengthen the whole line, the plan generally adopted is to form an entrenched camp by a line of square redoubts, flanking each other, and also a line of simple redans in front of the intervals of the redoubts.

FORTIGUERRA, NICCOLO, born at Pistoia, 1674; a prelate at the court of Pope Clement XI.; one of the best Italian poets in the first half of the eighteenth century, uniting the peculiarities of Ariosto, Berni, and Tassoni. In his epic poem *Ricciardetto*, so called from one of the Paladins of Charlemagne, he wished to show that it was easy to imitate Ariosto. He wrote the first canto of this poem in one night, and at the request of his friends continued the work. It extended to thirty cantos. He would not permit it to be printed before his death (February 17, 1785). It appeared (1788, in two vols. 8vo) under the name of Carteromaco, which had been assumed by the author during his life. The invention appears almost entirely his own. He treats history so arbitrarily that he makes his hero ascend the imperial throne after the death of Charlemagne. Symmetrical unity is not a characteristic of this work. Its principal excellence consists in the description of situations. He breaks off the thread of his narration according to his humour, and resumes it again as capriciously as Ariosto. But his descriptions are more comic than those of Ariosto, and more satirical than those of Berni and Tassoni. His satire on the corruptions of the clergy is very keen, and was probably the reason that he was so unwilling to have

the poem published. His short poems and sonnets are to be found in different collections of Italian poets.

FORTRESS. See **FORTIFICATION**.

FORTROSE, a seaport, royal and parliamentary burgh, of Scotland, in the county of Ross, occupying a romantic situation on the north shore of the Moray Firth, 8 miles north-east of Inverness, nearly opposite Fort George, with which there is communication by a ferry. It was formerly called Chanonry, from being the chanonry of Ross, where the bishop had his residence. It was united to the burgh of Rosemarkie, which is about 1 mile north-east from it, by a charter granted by King James II., anno 1455, under the common name of Fortross, now Fortrose. The town is spoken of as having been then a seat of the arts and sciences. Of its ancient cathedral only the south aisle of the chancel and the nave, besides the detached chapter-house, remain. These are built of red sandstone in the Decorated style. Though possessed of a good harbour and other advantages, the town has little trade. It is becoming a favourite summer resort. It unites with Inverness, Nairn, and Forres in returning a member to the House of Commons. Pop. in 1891, 871; in 1901, 1179.

FORT-ROYAL. See **FORT DE FRANCO**.

FORTUNA, called by the Greeks *Tychē*, the goddess of success. According to Hesiod she was a daughter of Oceanus; according to Pindar, a sister of the Fates. She had temples at Coriuth, Elis, and Smyrna, was worshipped in Italy before the building of Rome, and had a celebrated temple at Antium, in which were two statues, which were consulted as oracles, and gave responses either by signs or by lot. She had also a temple at Præneste, whence she was called *Dea Prænestina*. No less than twenty-six temples were erected to her at Rome, the first of which was built by Servius Tullius. She is generally delineated with two rudders, with one of which she guides the ship of prosperity, with the other that of misfortune. At a later period she was represented with a bandage over her eyes and a sceptre in her hand, and sitting or standing on a wheel or globe. She is usually dressed as a matron. Different symbols of Fortuna are found in different gems; for example, a circle drawn over a globe, a globe between a rudder and an ear of corn, and having a wheel standing on it. On a coin of the Emperor Geta she is represented sitting on the earth with her bosom bare, her right hand resting on a wheel, and holding in her left hand, resting on her lap, a horn of plenty. Her rudder is supported sometimes on a globe, at others on a wheel, and at others on the beak of a ship. She was often represented with wings, but never so by the Romans; for they said that, having flown over the whole earth without resting anywhere, she at length alighted on the Palatine Mount, laid aside her wings and shoes, and descended from her globe to remain for ever in Rome.

FORTUNA, a town, Spain, province and 11 miles north by east of Murcia, with three squares and several regular and tolerably well-built streets. In the vicinity are chalybeate thermal springs, which were once famous. Pop. 5600.

FORTUNATE ISLANDS. See **CANARIES**.

FORTUNE-TELLERS. By 5 Geo. IV. cap. lxxxiii. sec. 2, persons professing or pretending to tell fortunes are punishable as rogues and vagabonds. By an act passed in Scotland in 1679 the punishment for this offence is scourging and burning on the ear.

FORT WAYNE, a flourishing city, capital of Allen county, Indiana, United States, situated in a beautiful and well-cultivated country at the junction of the St. Mary's and St. Joseph's rivers, which here unite to form the Maumee. It derives its name from a fort erected here in 1794 by General Wayne.

The town has grown up with great rapidity, and is now one of the most important places in the state. It is the seat of a Roman Catholic episcopal see, and contains a Lutheran and a Methodist College. The industries are important, and include iron-founding, the manufacture of railway stock, lumber-working, wheel-manufacturing, &c. It has also a good trade. Pop. in 1900, 45,115.

FORT-WILLIAM, a town of Scotland, in the county of Inverness, on the east side of Loch Linnhe, and lying at the foot of Ben Nevis. It is situated near the south end of the Caledonian Canal, and receives its name from a fort built by Monk in 1655, rebuilt in 1689 by General Mackay, and now belonging to the West Highland Railway Company. It has a meteorological observatory in connection with the observatory on the top of Ben Nevis, a public hall, a school, court-house, and hospital, and there is now railway communication with Glasgow and the south by way of Helensburgh. There are distilleries in the neighbourhood. Pop. in 1881, 1590; in 1891, 1870; in 1901, 2087.

FORT WORTH, a city of the United States, capital of Tarrant county, Texas, on Trinity river, 32 miles west of Dallas. It is an important railway centre, and has grain elevators, foundries, tanneries, flour-mills, car-works, a large packing-house, &c Pop (1890), 23,076.

FORUM, among the Romans, any open place in a town where the markets and courts of justice were held. The *Forum Romanum* in ancient Rome was a splendid area, which was originally a lake or marsh. It was bounded on the south by Mount Palatine, and on the north-west by the Capitoline Hill. It was the centre of Roman public life, and around or near it were many of the important buildings of the city. Among these some of the chief were the Curia or Senate-house, the Regia or abode of the Pontifex Maximus, the temples of Vesta, Concord, Saturn, and Castor, the Basilica Emilia, the Basilica Julia, &c. A part of the forum, called the *Comitium*, was the place where popular assemblies were regularly held in ancient times. A famous street partly bounding the forum and leading up to the Capitol was the Sacra Via or Sacred Way. The forum was latterly adorned with an immense number of statues. This place, once the site of beautiful temples and other buildings, still exhibits numerous relics of its former majesty. Excavations carried on in recent times have thrown much light on various interesting points connected with this locality.

FOSCARI, **FRANCESCO**, Doge of Venice, born about 1372, elected in 1423. The whole period in which he governed the republic was one of war and tumult. His first war was against the Turks, in which he was successful. He then engaged in hostilities with Filippo Visconti, duke of Milan, and subjected to the republic the territories of Bergamo, Brescia, and Cremona, making the Adda the boundary of the Venetian dominions. Another war, in which nearly all the cities of Italy took part, was brought to an end by the Treaty of Capriano, by which Venice acquired Lonato, Velaggio, and Peschiera. In 1443 the doge formed a league with Sforza, the duke of Milan, and the republics of Genoa, Bologna, and Florence, against Alfonso, king of Naples, who was supported by the pope. The Papal excommunication did not prevent Sforza from bringing his opponents to terms by two splendid victories. Three of the doge's sons had died in the service of the republic, and now at the end of his career Jacopo, the only surviving son, was doomed to submit to a much harder fate. He was accused of having received presents or bribes from several foreign princes,

and was condemned to torture and exile in Creta. Some time after, prompted by a strong desire to see his country again at whatever peril, he returned, was seized, condemned again, and had scarcely reached his place of exile when he died. At this instigation of a rival, Jacopo Loredano, Foscari was deprived of his dogeship, which he had on two previous occasions wished to resign. The broken-hearted old man expired, it is said, when he heard the bells of St. Mark's announce the accession of his successor. On the story of Jacopo Foscari is founded Byron's tragedy of the Two Foscari.

FOSCOLO, **UGO**, an Italian poet and prose writer, was born on board a Venetian frigate near the island of Zante, in 1778, and educated at the University of Padua. He made his appearance as a dramatic poet at Venice, a year before the fall of that republic, with his *Thyestes*, in which he endeavoured to preserve the simplicity and strictness of *Alfieri* and the Greeks. The wild applause of the public could not blind the young poet to the defects of his piece; he was himself his severest critic. At the time of the overthrow of the ancient aristocracy of Venice, and the establishment of a democracy, Foscolo showed himself an ardent advocate of the new principles. But his prospects of advancement in the new republic were cut off by the cession of Venice to Austria. To divert his mind he wrote a romance, remarkable for vehemence of passion and feeling, under the title *Ultime Lettere di Jacopo Ortis* (Milan, 1802). An imitation of Goethe's *Werther* is observable in this work, but it is the political matter interwoven in it, and a sort of melancholy patriotism about the work, which made it so generally attractive to the Italians. The style is excellent. Foscolo then went to Milan, where his friend General Pino procured him a military commission. In 1803 he wrote a satire on some learned men, under the form of a commentary on the *Hair of Berenice* (*La Chioma di Berenice*), a poem of Callimachus, translated by Catullus. When some of the French troops were returning to France, Foscolo took this opportunity to go to Paris. After his return, 1807, he published the small poem *Del Sepolcri*, in which he handled the Milanese severely. The critics justly found fault with his verse as rough and unmusical, and he determined therefore to try another path. He undertook an edition of the works of Montecuculi from the original manuscripts. This important undertaking was not accomplished entirely to the satisfaction of competent judges, who accused him of ignorance of the fundamental principles of the art of war, and of too great freedom in supplying defective passages in the manuscripts. When Monti, of whom he had been a friend and defender, was on the point of publishing a translation of the *Iliad*, Foscolo produced a translation of the first book, accompanied with remarks evidently directed against Monti. This produced a coolness between the two friends; and Foscolo was thought to have written his two tragedies, *Ricciarda* and *Ajace*, with the same view. But the government, who found other feelings in these pieces, ordered him to leave Milan. To save appearances his friend Pino sent him, with a pretended commission, to Mantua. About this time he published his translation of Sterne's *Sentimental Journey*. At Mantua he lived until the abdication of Napoleon. He advocated with great warmth the independence of Italy. When Murat began the war he became so obnoxious to the Austrians that he found it necessary to leave Italy. He retired to Switzerland, then to Russia. In 1815 he went to London, where his reputation secured him a favourable reception from the most distinguished *literati* of the country. He contributed

many articles to the English periodicals, among which were two on Dante, in the twenty-ninth and thirtieth volumes of the Edinburgh Review. His *Essays on Petrarch* (London, 1821), and his *Discurso sul Testò di Dante* (1826), are valuable criticisms. He left dissertations and notes on the *Divina Commedia*, which have since been published. He was rather prodigal in his habits, and the last years of his life were passed in comparative poverty. He died, Sept. 10, 1827, at Turnham Green, near London.

FOSS (from the Latin *fossa*, French, *fosse*, a ditch), in fortification, a trench, commonly full of water, lying between the scarp and counterscarp, below the rampart, and turning round a fortified place, or a post that is to be defended.

FOSSANO, a town in North Italy, on the left bank of the Stura, on an elevated plain 13 miles north-east of Cuneo. It is surrounded by old walls, and defended by a castle, and has wide and regular streets lined with arcades, several squares, a handsome cathedral with some good paintings, several other churches and convents, a theatre, hospital, orphan hospital, and scientific academy. The manufactures are woollen and silk goods, ironware, leather, and paper, and the trade is in these and agricultural produce. Pop. 7279.

FOSSIL (Latin *fossilis*, from *fodio*, I dig), literally anything dug out of the earth, but now signifying only the remains of organic bodies found in geological formations. See **GEOLOGY** and **PALÆONTOLOGY**.

FOSSOMBRONE (ancient *Forum Sempronii*), a town, Italy, 38 miles W.N.W. of Ancona, on both sides of the Metauro, here crossed by a remarkably bold bridge of a single arch. The battle which decided the fate of Italy in the second Punic war was fought here 207 B.C. between the Romans and the Carthaginians, in which the latter were totally defeated, and Hasdrubal their general was killed. Some ruins of the ancient city still exist; the principal modern edifice is a fine cathedral. The manufactures, consisting of silk and woollen goods, are in high repute throughout Italy. Pop. 6936.

FOSTER, JOHN, a distinguished essayist, was born in the parish of Halifax, Yorkshire, on 17th September, 1770. From his earliest years John was a shy and retiring boy, averse to the society of others of his own age, and much given to reading and solitary meditation. After a short trial of the weaving trade he was sent to the school of his pastor, Dr. John Fawcett, with the view of receiving an education and preparing himself for the Baptist ministry. After remaining there for a year or two he proceeded in 1791 to the Baptist college at Bristol, then the only theological institution belonging to that denomination. Here he remained for a twelvemonth, made the acquaintance of Hannah More and her sisters, and had an opportunity for the first time of hearing Robert Hall preach. He then obtained the charge of a small congregation at Newcastle-on-Tyne, where, however, he only continued for three months; he passed over to Ireland, and served for a year in Dublin, first as a preacher and then as a schoolmaster. In 1797 he was appointed to a Baptist chapel at Chichester, from which in 1800 he removed to Downend, a village 5 miles from Bristol. On the recommendation of Robert Hall he became, in 1804, minister of a congregation at Frome, but after remaining there for two years an affection of the throat compelled him to resign his charge. A short time previous to this he had commenced contributing to the *Eclectic Review*, and for the next twelve years was a regular contributor to the extent of from ten

to twenty articles annually. During his residence at Frome he published his four celebrated essays, which at once established his fame as an author and thinker, and made Sir James Mackintosh characterize him as 'one of the most profound and eloquent writers that England has produced.' In little more than a twelvemonth from their publication they passed through three editions, and in 1846 had reached their eighteenth. Their titles are—On a Man's writing a Memoir of Himself; On the Application of the Epithet Romantic; On Decision of Character; and On some of the Causes by which Evangelical Religion has been rendered Unacceptable to Persons of cultivated Taste. All are marked by great solidity and depth of thought, combined with a lucidity and nervousness of style which no English author has surpassed. Of the four essays the palm is generally given to that On Decision of Character, though in the opinion of Robert Hall the fourth of the series was the work on which Foster's fame with posterity would rest. It contains much cogent and pertinent reasoning, and has undoubtedly exercised great influence in dissociating from the minds of many the ideas of vulgarity and narrowness of mind in connection with the reception of evangelical doctrines. In 1808 Foster married the lady to whom his essays had originally been addressed in the form of letters. On this event taking place he removed to Bourton-on-the-Water, a retired village in Gloucestershire, where he remained for several years, writing for the *Eclectic Review* during the week, and preaching on Sundays in the neighbouring villages. As a preacher Foster never succeeded in attracting much attention. His discourses, though solid and philosophical, were of too abstract and unadorned a nature to be readily appreciated by a popular audience. In 1817 he returned to Downend, where he wrote his Essay on the Evils of Popular Ignorance, in which he exposed the fearful condition of the masses in our large towns and other places, and strenuously urged the establishment of a national system of education. In 1826 he lost his only son, who died of consumption, and several years afterwards his wife. He was now left with two daughters, whose affectionate attentions tranquillized and cheered his declining days. After gradually sinking for some weeks, he expired peacefully on 15th October, 1843. A selection of his contributions to the *Eclectic Review* was published by Dr. Price in 1844, and his *Life and Correspondence*, edited by J. E. Ryland (two vols.), in 1846, republished in Bohn's Standard Library in 1852.

FOTHERING, a peculiar method of endeavouring to stop a leak in the bottom of a ship while she is afloat, either at sea or at anchor, which is performed by fastening a sail at the four corners, letting it down under the ship's bottom, and then putting a quantity of chopped rope-yarn, oakum, wool, cotton, &c., between it and the ship's side. By repeating the latter part of this operation several times the leak generally sucks in a portion of the loose stuff, and thereby becomes partly and sometimes wholly stopped. Some persons prefer thrumming the sail instead of letting down the loose stuff; but in this mode the sail is soon chafed through by the hole, if the leak is considerable, without affording sufficient substance to stop it.

FOUCHERAY, a village, England, county and 27 miles north-east of Northampton, pleasantly situated on the Neve. Its castle, to which a melancholy interest attaches as the scene of the imprisonment, trial, and execution of Mary Queen of Scots, was demolished by her son James I. Several of the illustrious Plantagenets are buried in its church.

FOUCAULT'S PENDULUM EXPERIMENT. M. Foucault, a French naturalist, pointed out a

curious and remarkable method of showing the rotation of the earth on its axis, by observing a vibrating pendulum, and his experiment goes under the above name. If a heavy ball is suspended by a fine wire and set to vibrate like a pendulum, it may easily be shown, either mathematically or by experiment, that the point of suspension, with the wire and ball, may be rotated round an axis, passing along the length of the wire, without interfering with the vibration. In other words, *the pendulum will continue to vibrate in the same plane, although the point of suspension be turned round the axis of suspension.* It follows immediately from this that if we could suspend a pendulum at the north or south pole and set it vibrating, it would continue to swing in the original plane of vibration; and as the earth is turning on its axis, a marked line on the earth's surface would appear to turn underneath the pendulum; or rather, it would seem to an observer, accustomed to feel as if the earth were at rest, that the plane in which the pendulum vibrates turns round relatively to the marked line on the earth's surface. It is easily shown that a similar phenomenon may be observed in any latitude except at the equator: the amount of rotation, however, that the plane of vibration of the pendulum seems to undergo is not so great in low latitudes as in high latitudes; but still in our latitudes rotation takes place to an extent easily observable. The performance of this experiment requires the greatest nicety. The pendulum is suspended on a fine wire, the support of the wire being constructed with great accuracy, so as not to interfere with the vibrations. The motion of the pendulum must be strictly confined to one plane; and, for that reason, in setting it to vibrate the bob is drawn aside and fastened by a silk thread, and when everything has come perfectly to rest the bob is released by burning the silk thread. During its subsequent motion it is protected from currents of air by glass screens. It need scarcely be remarked, however, that this beautiful experiment is nothing more than a fine illustration. Our knowledge of the rotation of the earth, drawn from astronomical considerations, cannot be strengthened by it. This experiment was first made public in 1851, when it was exhibited by M. Foucault before the Academy of Paris.

FOUCHÉ, JOSEPH, Duke of Otranto, born in 1768 at Nantes, received his education from the fathers of the oratory, first in his native town, and afterwards at Paris, where he distinguished himself by his rapid progress. The revolution, into which he entered with enthusiasm, found him teaching philosophy at Nantes. As he had not taken orders he married, became advocate, and was sent to the convention by the department of Loire-Inférieure. Here he was placed on the committee for public education, voted for the death of the king, and was implicated, at least nominally, in the atrocities of the period. In 1793 he was sent into the department of Nièvre to enforce the law against those who had incurred suspicion. In November, as a member of the convention, he accompanied the Commissioners Collot d'Herbois and Couthon to Lyons. In 1794, after his return, he incurred the hatred of Robespierre, and thus had a strong stimulus to assist in his downfall. In August, 1795, he was expelled from the convention, and kept a prisoner till the amnesty in October. In 1796 he communicated important information to the director Barras as to the designs of Babeuf, and was rewarded in 1798 by being sent to Milan as ambassador to the Cisalpine Republic. Here he laboured with General Brune to establish a second 18th Fructidor; both were in consequence recalled. He appeared in Paris in 1799, after Barras had gained the ascendancy, and was appointed ambassador to Holland. Shortly after

he was recalled and named minister of police. Here he first had full opportunity to display his great talents, and exercise an important influence on the interior policy of France. Sometime after he incurred the suspicion of the first consul, and in 1802 was suddenly deprived of his office; but he afterwards recovered favour, and in 1804 was again at the head of the police. The situation gave him great power during the war and the frequent absence of the emperor; but he appears to have used it with moderation, and exerted himself particularly to attach the royalists to the imperial throne. He had already obtained the title of count, and now received that of duke, with rich domains in the Kingdom of Naples. Napoleon, however, had repeated misgivings concerning him, and showed this particularly in 1810, when he deprived him of the ministry of police, and sent him as titular governor to Rome into a kind of exile. At this period he considered his rupture with Napoleon as almost final, and had serious thoughts of emigrating to the United States. At length he obtained permission to return to France and reside on his own estate, where he lived in private for several years. As Fouché and Talleyrand were resolved to keep away from the Russian campaign, Napoleon was with difficulty restrained from committing both of these dreaded men to prison. In the campaign of 1813 he sent for Fouché to his head-quarters at Dresden, sent him thence to Laybach as governor of the Illyrian provinces, and after the battle of Leipzig to Naples and Rome to watch the steps of Murat. When the latter revolted, Fouché was recalled to Paris, and by the way hesitated not to speak of Napoleon's approaching downfall. On the restoration of the Bourbons he pressed them to pursue a moderate course and proclaim a general amnesty; but as his advice was not followed, he retired into private life. On Napoleon's landing from Elba, the Bourbons offered him the ministry of police, and when he declined it gave order for his imprisonment. On the arrival of Napoleon he advised him, as a means of uniting all parties, to lay aside the title of emperor and place himself as generalissimo at the head of the republic. He, however, accepted the ministry of police, and entered into communication with the courts of Austria and Great Britain. When the proclamation of the European powers appeared he wished Napoleon to make a timely abdication in favour of his son, but all his counsels were received with suspicion and distrust. After the battle of Waterloo, Fouché urged Napoleon's second abdication, and advised him to seek an asylum in the United States. He placed himself at the head of the provisional government, negotiated the capitulation of Paris, obtained the removal of the army behind the Loire, and thus prevented useless bloodshed. Louis XVIII., whose return to the throne he had not at all supported, made him again minister of police; and it is to his credit that he laboured so zealously in favour of moderate measures as to incur the hatred of all the ultra-royalists. At last, however, he yielded so far to their wishes as to publish a proscription containing a list of thirty-seven persons, but he thus only placed himself in a false position by offending the moderate without at all conciliating the ultra party. He therefore resigned his ministerial office in 1815; and with his young wife, whom he had shortly before married out of an ancient house in Provence, proceeded as French ambassador to Dresden. As he was struck at by the decree issued in 1816 against the murderers of the king, he sought an asylum in Prussia. He afterwards went first to Lintz, and then to Trieste, where he died in 1820. It was Fouché who made the famous remark on the execution of the Duke of Enghien, of which he disapproved: 'C'est plus qu'un crime, c'est une faute' (It is more than a crime; it is a blunder).

FOUGÈRES, a town of France, in the department of Ille-et-Vilaine, on a height, 28 miles N.E. of Rennes. It was once fortified, so as to be considered one of the keys of Brittany, but is now open, well built, and has manufactures of coarse flannels, sailcloth, sackings, lace, and hats, dye-works, tanneries, glass-works, paper-mills, and a considerable trade. The town was taken by Henry II. of England in 1166, and again in 1178. It fell again into the hands of the English in 1488. In 1793, during the Vendean war, an important battle was fought in its vicinity. Pop. (1896), 19,240.

FOULAHs. See **FELLATAHs**.

FOULIS, ROBERT and ANDREW, two eminent printers of Glasgow, were born there—the former in 1707, the latter in 1712. Though in humble circumstances, they were both well educated, and availed themselves of the advantages of the Glasgow University, Robert apparently only to gratify his thirst for knowledge, and Andrew with a view to the church. In 1739 Robert commenced business in his native city as a bookseller; and in 1742, having obtained the appointment of printer to the university, began in that capacity to issue editions of the ancient classics, which have made his press famous, both from the beauty of their type and their accuracy. In this latter respect one of his editions of Horace stands pre-eminent, and is hence known by the name of the 'Immaculate' edition. The sheets, as they issued from the press, were hung out of the window for examination, with the offer of the reward of a guinea for any blunder detected in them. Tempting as the offer must have been, it did not secure perfect accuracy, for the 'Immaculate' edition contains at least ten typographical errors, of which a list has been given by Mr. Dibdin. After some years Andrew entered into partnership with his brother, and their business continued to prosper. Unfortunately they entered into a speculation for the establishment of an academy of the fine arts, and involved themselves in expenses which consumed the profits of their press, and absorbed the capital which ought to have been devoted to it. Disaster ensued; and the press, which had come to be regarded as a secondary object, fell from its high character, particularly after the death of Robert, on the 18th of September, 1775. Andrew, who survived till 1781, had far less talent than his brother, and entirely failed to restore the position of the Foulis press.

FOUNDATION, in architecture, is that part of a building which is under the general level of the ground, or as more commonly used, the ground on which the walls of a building are erected. The practice of the ancients of laying the foundations on concrete (lime mixed with coarse gravel, sand, and small stones) has lately been revived with much success in cases where the soil is soft. Sand forms a good foundation, provided it be prevented from spreading laterally.—*Foundation*, in ecclesiastical or academic matters, is a donation or legacy, in money or lands, invested or settled for the permanent maintenance or support of some useful institution, as a hospital, a college, a school, &c.

FOUNDING. See **CASTING**.

FOUNDLING, a child abandoned by its parents, and found by strangers. Though infanticide was not punished among the ancient nations, yet natural feeling would prompt parents rather to expose their offspring, and leave their fate to accident. They usually selected places which were much frequented, where there was a greater chance of the child being saved. In Athens and Rome they were exposed in particular places. In the fourth century the emperors Valentinian, Valerius, and Gratian prohibited this cruel practice, which is at present a crime by the laws of all civilized nations. Even in ancient times

the state made provision for the preservation of exposed children; but foundling hospitals are an institution of modern times.

The foundling hospital in Paris was formally established in 1670, and is the most famous institution of the kind in the world. It receives not only foundlings strictly so called, that is deserted children of unknown parentage, but also deserted children of known parents, and destitute children generally, as well as children pronounced incorrigible by the law courts or declared to be so by their parents. The institution also assists poor mothers by donations, and by sending nurses for their infants. The children received are at once sent to the country and boarded out, their foster-parents receiving a certain payment from the state, which ceases after twelve years. The children are now apprenticed or employed in some way, but they do not pass from the supervision of the state till they reach the age of twenty-one. Foundling hospitals exist in many other countries, but in the United Kingdom there is no founding hospital properly so called. The Foundling Hospital in London, established by Captain Thomas Coram in 1739, was originally a hospital for exposed and deserted children. It was for a time extremely popular, and was repeatedly assisted by parliamentary grants; but the enormous increase of abandonments, and the expense which they occasioned, produced such an alteration in public opinion that the hospital was changed to what it now is, a hospital for poor illegitimate children whose mothers are known. For a number of years all children were taken in that were accompanied by a hundred-pound note, no questions being asked, and naturally it was children of parents of the better class that obtained admission in this way. The regulations as to admission are now rather strict and somewhat peculiar. No child more than a year old is received, nor the child of a domestic servant, nor one whose father can be compelled to keep it. The mother's character must bear inspection, and the child must be the result of her 'first fault'. The mother has to present a petition for the admission of her child, and has to appear before the board and answer any inquiries that may be made. The child when received is at once baptized, and is then sent to the country to be nursed under due supervision, being entirely separated from the mother. After five years the children are brought back to the institution, where they receive a plain education, the boys being then generally apprenticed to tradesmen, and the girls engaged as domestic servants. Foundling hospitals are said to diminish not only the exposing of children, but also to render infanticide and intentional abortion less frequent. The objection that they contribute to the corruption of morals, if they receive children indiscriminately, and that they encourage parents to rid themselves of responsibility, is the strongest which can be urged against such institutions, and is not easily answered. All exposed children in Britain are brought up at the expense of the parish in which they are found.

FOUNT, or **FONT**, among printers, &c., a set of types, sorted for use, that includes running letters, large and small capitals, single letters, double letters, points, commas, lines, numerals, &c.; as a fount of English, of Pica, Bourgeois, &c. A fount of 100,000 characters, which is a common fount, would contain 5000 types of a, 3000 of c, 11,000 of e, 6000 of i, 3000 of m, and about 30 or 40 of k, z, y, and x. But this is only to be understood of the lower-case types; those of the upper case having other proportions, which we need not here enumerate.

FOUNTAIN, or **ARTIFICIAL FOUNTAIN**, in hydraulics, a machine or contrivance by which water is

violently spouted or darted up; called also a *jet d'eau*. There are various kinds of artificial fountains, but all formed by a pressure, of one sort or another, upon the water, viz., either the pressure or weight of a head of water, or the pressure arising from the spring and elasticity of the air, &c. When these are formed by the pressure of a head of water, or any other fluid of the same kind with the fountain or jet, then will this spout up nearly to the same height as that head, abating only a little for the resistance of the air, with that of the adjutage or pipe from which the water spouts, &c., in the fluid rushing through; but when the jet is produced by any other force than the pressure of a column of the same fluid with itself, it will rise to such a height as is nearly equal to the altitude of a column of the same fluid, whose pressure is equal to the given force that produces the fountain. In ancient Greece every principal town had public fountains or conduits, some of which were of handsome design and of beautiful execution. In the city of Megara there was a public fountain established by Theagenes, which was celebrated for its grandeur and magnificence. The fountain of *Pirene*, a fountain at Corinth, was encircled by an inclosure of white marble, which was sculptured into various grottoes, from which the water ran into a splendid basin of the same material. Another fountain in Corinth, which was called *Lerna*, was encircled by a beautiful portico, under which were seats for the public to sit upon during the extreme heats of summer to enjoy the cool air from the falling waters. In the sacred wood of Æsculapius, at Epidaurus, there was a fountain that Pausanias cites as remarkable for the beauty of its decorations. At Messina there were also two elegant fountains, one called *Arsinoë* and the other *Clepydra*. Pausanias also alludes to several other fountains in various parts of Greece, celebrated for the grandeur and beauty of their architectural and sculptural decorations.

The ancient fondness for fountains still exists in Italy and the East. The French are celebrated for their fountains, but Italy, more particularly Rome, is still more so. The fountains of Paris and of the Tuilleries, of the orangery at Versailles, at St. Cloud, and other places in the neighbourhood, are splendid structures. The principal and most admired fountains at or near Rome are those in front of St. Peter's, of the Villa Aldobrandini at Frascati, of the Termini, of Mount Janiculum, of the gardens of the Belvedere, in the Vatican, of the Villa Borghese, which has also in the audience chamber a splendid fountain of silver, five Roman palms in height, ornamented with superb vases and flowers; the fountains of Trevi, the three fountains of St. Paul, of the Acqua Acetosa, and many others described in the numerous works on that ancient city. Sir Henry Wotton describes, in his *Elements of Architecture*, a fountain by Michael Angelo, in the figure of a sturdy woman wringing a bundle of clothes, from whence the water issues that supplies the basin. Owing to the modern mode of distributing the supply of water in pipes through the houses, fountains are now for the most part merely ornamental. It is found, however, that in large towns public supplies of water are wanted for man and beast, and these are now furnished by the numerous drinking fountains which are being erected in all our important towns.

FOUQUE, FRIEDRICH HEINRICH KARL, Baron de la Motte, a German poet and novelist, born at Brandenburg in 1777, served as Lieutenant of the Prussian guards in the campaign of 1792, and thereafter lived in rural retirement, devoting himself to the muses. At a later period he returned to the army, and was present in 1813 at the most important battles in the war of Liberation, till, in consequence

of a severe strain, he was obliged to take his discharge, after attaining the rank of major. He latterly divided his residence between Paris and his own estate near Rathenow, then lived several years at Halle, and died at Berlin in 1843. As a writer he is remarkable both for variety and fecundity, and has published poetry in almost all its forms—dramatic, epic, romantic, &c. Several of his short romantic tales in prose, such as *Der Zauberring*, *Aslauga's Ritter*, but more especially his *Undine*, enjoy an extraordinary popularity. The last mentioned tale, a charming mixture of fairy idealism, the reality of humble life, and the glow of chivalry, has gone through many editions, and has been translated into every European language. It must be admitted that Fouqué, while possessing many of the virtues of the romantic school, was guilty of all its extravagances, and that the descriptions of chivalric and feudal life, in which he delighted, are mere fancy pictures.

FOUQUÉ, HEINRICH AUGUST, Baron de la Motte, a distinguished Prussian general in the Seven Years' war, born in 1698, was descended from an old Norman family which had fled on account of religious persecutions to the Hague. Fouqué possessed the confidence of Frederick the Great; and the *Mémoires du Baron de la Motte Fouqué* (two vols. Berlin, 1788, by Büttner, the secretary of Fouqué), which contain his correspondence with Frederick the Great, are therefore highly interesting. His nephew has written his life (Berlin, 1825) from family papers. (General Fouqué died May 2d, 1774. The poet and novelist Fouqué, the subject of the preceding article, was grandson of this gallant soldier.)

FOUQUIER-TINVILLE, ANTOINE QUENTIN, notorious for his ferocious cruelty in the first French revolution, was born at Hérouvelles, near St. Quentin, in 1747. His excesses obliged him to sell the place of a *procureur au Châtelet* (attorney in the court of this name) which he had purchased, and to declare himself insolvent. As a member of the revolutionary tribunal he distinguished himself by his alacrity in pronouncing the verdict of guilty, and attracted the attention of Robespierre, who gave him the office of public accuser before this tribunal. The victims now became numberless. Fouquier drew up the scandalous articles of accusation against the queen, Marie Antoinette. His thirst for blood seems to have been increased by gratification, until it became a real insanity. He proposed the execution of Robespierre and all the members of the revolutionary tribunal 9th Thermidor, 1794, was himself removed on the 14th Thermidor (August 1), 1794, and arrested. He died May 7, 1795, under the guillotine, in a cowardly manner. There does not appear to be a trait in the life of this monster which can entitle his crimes to the same palliation as those of Robespierre, who considered the extermination of the aristocracy as a necessary evil.

FOURCHAMBAULT, a town, France, in the department of Nièvre, situated on the right bank of the Loire, about 4 miles north-east of Nevers. It is remarkable for its extensive iron-smelting furnaces and forges, which give employment to about 5000 workmen. The Loire is here spanned by a fine iron bridge, and from the height on which the parish church has been erected a magnificent view of the valley of the river is obtained. Pop. (1891), 5810.

FOURCROY, ANTOINE FRANÇOIS DE, a celebrated French chemist and natural philosopher, was born in Paris, June 15, 1755, and educated at the college of Harcourt. Though well descended his father was very poor, and for the first eighteen years or more of his life Fourcroy had a very hard struggle for existence. He taught writing, and even thought of

becoming an actor; but the ill success of one of his friends deterred him. Having adopted the profession of medicine he applied himself closely to the study of the sciences connected with it, and especially to chemistry. He published in 1776 a translation of Ramazzini's *Treatise on the Diseases of Artisans*. In 1780, after great opposition, and only when the fees required had been subscribed by his friends, he took the degree of M.D.; in 1784 he was made professor of chemistry at the Jardin du Roi; and the next year he was chosen a member of the Academy of Sciences. At this period he became associated with Lavoisier, Guyton-Morveau, and Berthollet in the researches which led to the vast improvements and discoveries in chemistry which have immortalized their names; and, along with them, he drew up the *Méthode de Nomenclature chimique* (Paris, 1787, 8vo). When the revolution took place he engaged in politics, and was chosen a deputy from Paris to the national convention. He did not, however, take his seat in that assembly till after the fall of Robespierre. In September, 1794, he became a member of the committee of public safety. His attention in this post was chiefly directed to the formation of public schools and the establishment of institutions for the education of youth. He organized the central school of public works, out of which the polytechnic school afterwards sprang, and co-operated in the establishment of the normal schools. In September, 1795, he passed into the council of ancients, and was nominated professor of chemistry and a member of the National Institute. He vacated his seat in the council in May, 1797, and in December, 1799, Bonaparte gave him a place in the council of state, in the section of the interior, in which place he drew up a plan for a system of public instruction, which, with some alteration, was adopted. He died December 16, 1809. His works are numerous, among which the following are the most important. *Leçons Élémentaires d'Histoire naturelle et de Chimie* (1791, five vols. 8vo); *Système des Connaissances chimiques, et de leurs Applications aux Phénomènes de la Nature et de l'Art* (1805, ten vols. 8vo); *Philosophie chimique*, 8vo; *Tableaux synoptiques de Chimie* (1805); and *La Médecine éclairée par les Sciences physiques* (four vols. 8vo). He also published many papers in the *Memoirs of the Academy of Sciences*, and in other periodicals, especially on the various substances prepared from animals. In these investigations he was frequently assisted by Vauquelin, and it has been said that Fourcroy's share consisted in drawing up the results. Be this as it may, Fourcroy made no discovery which had influence on the science as a whole, but he contributed largely to the progress of Lavoisier's views by his writings and lectures. As a lecturer indeed he was extremely successful, and crowds of listeners attended his courses. The same qualities are found in his writings, though these are now only of historical interest.

FOURIER, FRANÇOIS MARIE CHARLES, a French socialist, and founder of the system named after him, was born in 1772 at Besançon. It was the intention of his father, a cloth dealer, who died when his son had scarcely reached his ninth year, and to whom he left a legacy of over £3000, that he should devote himself to commerce. He studied with but moderate success in the college of his native town, and subsequently at Rouen and Lyons occupied subordinate situations in mercantile houses. In the last-mentioned town he entered into business on his own account, but the siege of the city by the troops of the convention and the subsequent disorders were fatal to his prosperity, and for two years he served as a conscript. He was afterwards employed by a firm in Marseilles, and an incident occurred while

here which influenced the whole of his after-life. In order to keep up the price of rice in the market his employers had retained a cargo until it was unfit for use, and Fourier was instructed to have it thrown into the sea. This proceeding seemed so infamous that he took, as he expressed it, 'the oath of Hannibal against trade'—an oath to which he remained true in his doctrine, and in numerous writings, published under different circumstances. His system, of which a short account is given below, is most fully detailed in his *Traité de l'Association domestique agricole*—a strange work, which contains highly intellectual passages amidst a mass of absurdities and eccentricities, in a harsh and obscure style, and a new-fangled terminology. He died in 1837, so firmly persuaded of the practicability of his scheme that he is said, for a period of many years, to have returned home daily at a certain hour in the hope that at length some wealthy convert to his system would appear and furnish him with capital to enable him to carry the theory into effect. An association established under his direction in 1830, and a journal, the *Phalange*, started to enlighten the public as to the merits of the system, both met with speedy failure; but Fourier held that the scheme had not got fair play, and that it was not from inherent defects in the theory that the undertaking was a failure.

FOURIER, JEAN BAPTISTE JOSEPH, a distinguished French mathematician, born of an influential family at Auxerre in 1768, was educated in the military school there, became one of its teachers at the age of eighteen, was afterwards in the Paris normal school, and after holding an appointment for a short time in the polytechnic school followed Bonaparte to Egypt. Here he performed important political service, and was likewise secretary of the Institute of Egypt and an active contributor to the *Description de l'Égypte*, the masterly introduction to which was written by him. After his return he was, in 1802, appointed prefect of the department of Isère, and in 1808 named a baron. In his capacity as prefect he accomplished what had for a century been earnestly desired, the draining of the marshes in Bourgoin, near Lyons. After Napoleon's return from Elba Fourier issued a royalist proclamation, but was nevertheless appointed prefect of the Rhone, though soon after deprived of the office. He now established his residence in Paris, lived entirely devoted to study, and was in 1815 admitted a member of the Academy of Sciences, and at a later period appointed secretary for life. He died in 1830. His most celebrated work is the *Théorie analytique de la Chaleur*, in which he employs entirely new methods of mathematical investigation. A kindred subject is considered in his *Mémoire sur les Températures du Globe terrestre et des Espaces planétaires*. In connection with the subject of heat he studied the theory of equations, which is indebted to him for several important improvements. Equally important is his work, *Analyse des Equations déterminées*, which was left unfinished, but published after his death by Navier.

FOURIERISM, the social system constructed by F. M. C. Fourier. It does not contemplate the abolition of private property, nor even of inheritance; on the contrary, it avowedly takes into consideration, as an element in the distribution of produce, capital as well as labour. The operations of industry should be carried on by *Phalansteries*, or associations of 1800 members combining their labour on a district of about a square league in extent, under the control of governors elected by each community. In the distribution a certain minimum is first assigned for the subsistence of every member of the society, whether capable or not of labour. The remainder of the pro-

duce is shared in certain proportions to be previously determined among the three elements, labour, capital, and talent. The capital of the community may be owned in unequal shares by different members, who would in that case receive, as in any other joint-stock concern, proportional dividends. The claim of each person on the share of the produce apportioned to talent is estimated by the grade which the individual occupies in the several groups of labourers to which he or she belongs, these grades being in every case conferred by the voice of his or her companions. The remuneration received would not of necessity be expended in common. Separate rooms or sets of rooms would be set aside for those who applied for them, no other community of living being contemplated than that all the members of the association should reside in the same pile of buildings, for saving of labour and expense not only in building but in all the processes of domestic life, and in order that, the whole buying and selling of the community being effected by a single agent, the enormous portion of the produce of industry now carried off by the profits of mere distribution might be reduced to the narrowest possible margin.

FOUR MASTERS, the name given to four Irish writers, by whom a work on the history of Ireland was written in the Irish language, well-known by the title *Annals of the Four Masters*. It treats of the history of the country from 1172 to 1616, with notices of the earlier history, and it was written between 1632 and 1636. The text together with an English translation was published by Donovan in 1848. The chief 'master' was Michael O'Clery (1575-1643).

FOWL (Anglo-Saxon *fugel*, Dutch and German *vogel*, a bird, a word of unknown root), a word originally synonymous with bird, now used in a stricter sense to designate the genus *Gallus*, of which the common domestic fowl (cock and hen) is a familiar example. The general form and characters of the bill, feet, &c., agree with those of the pheasants, but the crown of the head is generally naked and furnished with a fleshy comb, the base of the lower mandibles also bearing fleshy lobes or wattles—characters which are most conspicuous in the males. Referring to our article COCK for fuller particulars, we proceed to mention a few of the more notable examples of this genus. The *Jungle Fowl*, a native of India, is a powerful bird in proportion to its size, which is rather less than that of the domestic fowl. The back and lower portions of the body are deep-gray, and the tail is long, arched, and beautifully coloured with changing hues of purple, green, and gold. The *Bankiva Jungle Fowl*, now supposed to be the original stock of the domesticated poultry, is a native of Java. The male closely resembles the English game-cock. The comb and wattles are of the brightest scarlet, the long hackles of the neck and lower parts of the back are fine orange-red, the upper part of the back is deep blue-black, and the shoulders ruddy chestnut. The long, arched, and drooping tail is blue-black, glossed with green, and the breast and underparts black. The *Cochin-China Fowl*, a large and ungainly bird, is valuable chiefly owing to its fecundity, eggs being laid even during winter. The *Game Fowl* is noted for its pugnacity, its bright plumage, and excellent flesh. The *Dorkings* are a short-legged, round-bodied plump breed, remarkable for having at least one and sometimes two supplementary toes. The *Spanish Fowl* is a very fine variety, glossy black, with a large comb. It is next in size to the *Cochin-China* breed, but much superior in symmetry. Its flesh is excellent, and the hens are regular layers, so that the bird is in high estimation with poultry keepers. The *Bantam*,

a puny little member of the tribe, is remarkable for its fierce courage, its full breast, and feathered legs. It is of little use to the breeder, and may be classed among the fancy fowls, of which there seems to be infinite variety. The common *Barn-door Fowl* is of no particular breed, no pains being taken to prevent crossing, but is a kind of compound of all the foregoing except the bantam, from which it should be kept separate, as tending to diminish the size of the birds and their eggs.

FOWLING. See BIRD-CATCHING.

FOX, an animal closely allied to the dog, a native of almost every quarter of the globe, and generally esteemed the most sagacious and crafty of all beasts of prey. The former quality he demonstrates in his mode of providing himself an asylum, and the latter in his schemes for catching his prey. The fox belongs to the genus *Canis* of naturalists, and has been formed into the sub-genus *Vulpes* on account of its longer and more bushy tail, more pointed muzzle, nocturnal pupils, less slanting superior incisive teeth, fetid odour, and habit of burrowing. All the species are wily and voracious, greedily devouring birds and small quadrupeds, disliked and betrayed by most of those animals who dread their attacks, and extremely difficult to be tamed, even when very young. The fox, like the wolf, is the constant object of persecution, from the ravages he commits not only on domestic animals, but also on some fruits. He has been the destroyer of grapes from the earliest records. He devours honey, sucks eggs, carries off poultry, and commits mischief in every possible form. The following is the arrangement given in the British Museum Catalogue, by Dr. J. E. Gray:—A. LARGE. a. European: *V. vulgaris*, Fox. b. African. *V. Nilotica*, Sobora (Arab), Tahaleh (Egyptian). *V. adusta*, Caffraria. *V. variegata*, Schomor Abu. *V. mesomelas*. c. Asiatic: *V. flavescens*, Persian fox. *V. montana*, hill-fox of Nepal. *V. Griffithii*, Afghanistan. d. American: *V. Pennsylvanica* (*decussata*), crossed fox. *V. velox* (*cinereus* *argenteata*), burrowing fox. B. SMALL. Asiatic: *V. ferulata*, Thibet. *V. leucopus*, *V. Japonica*, *V. Bengalensis*, the kokree. *V. pusilla*, Punjaub. *V. karagau*, Ural. *V. corsac*, Tartary.

The Common Fox of Europe (*Vulpes vulgaris*, see illustration at CARNIVORA) has long been celebrated for his wonderful cunning, and abused for his predatory habits. His handsome tail is known to be of great use to him in various ways. By means of it he is able to suddenly change his direction, and it is also employed in leaping and climbing. The general body colour is reddish-brown, but the tip of the tail and other parts are often white. His food consists of rabbits, rats, mice, beetles, &c. The den of this fox is situated under hard ground, the roots of trees, &c., and furnished with proper outlets. He hunts from sunset till early morning, and remains in his lair during the daytime. He is often hunted for sport. When he finds himself pursued he usually makes for his hole, and, penetrating to the bottom, lies quiet. If his den is under a rock or the roots of trees, he is safe, for a terrier is no match for him there, and he cannot be dug out. When the retreat to his den is cut off, his stratagems to escape are various. He always seeks the most woody parts of the country, and prefers paths beset by thorns and briars. He has been known to shake off the scent by rolling in manure, by running for a time along the top of a wall, and other similarly ingenious artifices. He possesses astonishing acuteness of smell. During winter he makes a continual yelping, but in summer he is usually silent. The young are born about April. See FOX-HUNTING in SURF.

Black Fox (*V. argentatus*).—This species is strik-

ingly similar to the common fox, and is only distinguishable by its copious and beautiful fur, which is of a rich and shining black colour, having a small quantity of white mixed with it in different proportions. It inhabits the northern parts of Asia and America, and is much hunted owing to the value of its fur. Some naturalists regard it as a mere variety of the red fox.

Red Fox (V. fulvus).—This species is found throughout North America, and has been considered as identical with the common fox of Europe, though there can be no doubt of their difference. The general colour of this fox in summer is bright ferruginous on the head, back, and sides. Beneath the chin it is white, whilst the throat and neck are of a dark gray. The under parts of the body towards the tail are very pale red. It is about 2 feet long and 18 inches high. The skins are much sought for, and are employed in various manufactures. When caught young this fox may be domesticated to a certain degree, but they are always unpleasant from the fetor of their urine.

Crossed Fox (V. Pennsylvanica or decussata).—This differs very much from the common fox. The colour of his fur is a sort of gray, resulting from the mixture of black and white hair. He has a black cross on his shoulders, from which he derives his name. The muzzle, lower parts of the body, and the feet, are black; the tail is terminated with white. It inhabits the northern parts of America, and may perhaps be only a variety of the black fox.

Swift Fox (V. velox, Say).—This beautiful little animal, which was first accurately described by Mr Say, inhabits the great plains which lie at the base of the Rocky Mountains. It is much smaller than the other American species, and forms its habitation by burrowing. It is distinguished by its extraordinary speed, which appears to surpass that of any other animal. When at the top of its speed it seems rather to fly than touch the ground in its course. It is even stated, that such is its rapid motion, that the effect produced on the eye is that of a line swiftly drawn along the surface, the parts of the animal's body being wholly undistinguishable. Its body is slender, and the tail rather long, cylindrical, and black. The hair is fine, dense, and soft. It somewhat resembles the *V. corsac*, which inhabits the vast plains of Tartary.

Gray Fox (Urocyon Virginianus or cinereo-argenteus). is common throughout the northern parts of America, more particularly in the neighbourhood of habitations. Its general colour is gray, becoming gradually darker from the shoulders to the hips. It has a sharp head, marked by a blackish-gray triangle, which gives it a peculiar physiognomy. The tail is thick, and contains at its tip a tuft of stiff hairs, hence the sub-generic distinction of the bristle-tailed foxes.

Arctic Fox (V. lagopus).—This is smaller than the common fox; its nose is sharp, but the skull is shorter than in the European fox. It is now erected into a distinct sub-genus of *Canis*, under the name *Leucocyon*. It has short rounded ears almost hid in its fur; its hair is long, soft, and somewhat woolly; its legs are short, having the toes covered with fur, like those of the hare: hence its specific name. It inhabits the countries bordering on the Frozen Ocean in both continents. In October and November, like the common fox, it is the most sleek and has the best coat of hair, which, later in the season, becomes too thick and ragged. As the winter commences it grows perfectly white, changing colour last on the ridge of the back and tip of the tail. In April and May it begins to shed its coat. In June it drops its cubs, from three to five in a litter. This fox preys upon various small quad-

rupeds, such as hares, marmots, &c., as well as upon partridges and other birds, the carcasses of fish left on shore; and, driven by necessity, it will eat indiscriminately whatever may promise to allay its hunger. We are informed by travellers that it exerts an extraordinary degree of cunning in taking fish. It goes into the water, and makes a splash with its feet in order to attract them, and when they come up immediately seizes them. It is taken with great facility in traps; and it is a singular circumstance that these animals will prey on each other, when they find individuals killed, wounded, or caught, as readily as upon any other food. Their skins are not of any great value.

FOX, CHARLES JAMES. This eminent statesman was the second son of Henry, first Lord Holland, so long the rival and opponent of the Earl of Chatham. Charles James was born January 24, 1749, and early became a favourite with his father, who, perceiving indications of great capacity, mingled exceeding indulgence with the most careful attention to his education. He was sent to Eton, whence he removed to Hertford College, Oxford; and his classical acquirements were very considerable. His father procured him a seat for the borough of Midhurst in 1768, before he was of legal age, and in 1770 the same interest procured him the office of one of the lords of the admiralty, which situation he resigned in 1772, and was appointed a commissioner of the treasury. Acting at this period under the influence of his father, his parliamentary conduct led to little anticipation of his future career. He spoke and voted against Wilkes, but warmly supported Sir William Meredith's bill to give relief from subscription to the thirty-nine articles, and in several other respects asserted his independence.

After being a supporter of the administration for six years, Mr. Fox was ejected owing to a quarrel with Lord North, and was thrown into the ranks of the opposition. The adoption of the disastrous measures which terminated in the independence of the American colonies enabled him to take this part without opposing any of the policy which he had previously supported. During the whole of this eventful contest he spoke and voted in direct opposition to the ministerial system, and, in conjunction with Burke, Barré, Dunning, and other eminent leaders, displayed the highest talents both as a statesman and orator. In 1780 he became a candidate for the representation of the city of Westminster, and succeeded, although opposed by the whole influence of the crown. On the final defeat of the weak and calamitous administration of Lord North, and the accession of that of the Marquis of Rockingham, Mr. Fox obtained the office of secretary of state for foreign affairs. But the death of the Marquis of Rockingham suddenly divided the party; and on the Earl of Shelburne becoming first lord of the treasury, in preference to the Duke of Portland, Mr. Fox retired in disgust; and soon after a union took place between his friends and those of Lord North, which, under the name of the *coalition*, was odious to the great mass of the people. The temporary success of this party movement served only to render popular disgust the more general; and when, on occasion of the famous India bill, the dissatisfaction of the sovereign became apparent, the dismissal of the coalition excited general satisfaction. At the ensuing election nearly seventy of his friends lost their seats, and he had himself to enter into a strong and expensive contest for the representation of Westminster. Still, although in the new Parliament Mr. Pitt had a decided majority, Mr. Fox headed a very strong opposition, and political questions were for some years contested with a display of talent on both sides.

which the House of Commons had seldom previously exhibited.

In 1788 Mr. Fox repaired to the Continent, and was proceeding to Italy when he was recalled by the king's illness, and the necessity of constituting a regency. The contest for the unrestricted right of the heir-apparent, which he warmly espoused, was marked by a great display of oratorical and logical talent on the part of the opposition; but, both in and out of Parliament, the majority on this occasion was with Mr. Pitt. In 1790 and 1791 Mr. Fox regained a share of popularity by his opposition to war with Spain and Russia, and also by his libel bill, regulating the rights of juries in criminal cases, and rendering them judges both of the law and the fact. On the breaking out of the French revolution he was disposed to regard it as likely to prove extremely beneficial. The contrary views of Mr. Burke, and the extraordinary manner in which that warm politician on that account publicly renounced his friendship, is one of the most striking incidents in parliamentary history. The policy of the war that followed belongs to history. Mr. Fox firmly opposed the principle on which it commenced, and strenuously argued for peace on every occasion; and at the Treaty of Amiens, in 1801, gave Mr. Addington, who concluded it, his support. When hostilities were renewed he also doubted of their necessity; but on becoming secretary of state for foreign affairs, in conjunction with the Grenville party, he acquiesced in its propriety. His political career was now, however, drawing towards the close; his health began rapidly to decline; symptoms of dropsy appeared; and in a few months after the death of Mr. Pitt, his great rival, was laid in an almost contiguous grave. Mr. Fox died September 13, 1806, without pain, and almost without a struggle.

The opinions formed of this eminent leader as a practical and theoretical statesman, it is unnecessary to say, have been as various as the shades of party difference. That he was a sincere friend to all the broad and generous principles on the due development of which rest the freedom and best interests of mankind, is not to be doubted, and that they were alloyed by great latitude on the subject of party and political expediency is equally clear. As a powerful and purely argumentative orator he was of the very first class; although as to eloquence and brilliancy he perhaps yielded to Pitt, Burke, and Sheridan; nor were his voice and manner prepossessing, although highly forcible. Of his amiability in private life, allowing for a dissipated youth, all accounts agree. Friends and foes equally testify to his ingenuous and benign character. The result of this happy temperament was that no man was ever more idolized by a wide and extensive connection. As an author, besides some Latin poetry and a Greek dialogue, by which he highly distinguished himself at Eton, and a few numbers of a paper entitled *The Englishman*, he published nothing during his lifetime but *A Letter to the Electors of Westminster* (1793), which was read with great avidity. To his nephew, Lord Holland, the world is indebted for his posthumous publication, entitled *The History of the Early Part of the Reign of James II.*, with an introductory chapter, intended to form a commencement of the history of the Revolution of 1688. It is written with unpretending simplicity, but disappointed expectation, and has never been popular. The chief works on Fox are *Earl Russell's Life and Times of C. J. Fox* (1859-66), and *Memorials and Correspondence* (1853-57).

FOX, GEORGE, the founder of the Society of Friends, or Quakers, was born at Drayton, in Leicestershire, in 1624. His father, who was a weaver, educated him religiously. At an early age he was

employed in keeping sheep. Subsequently he was apprenticed to a country shoemaker. At the age of nineteen he persuaded himself that he had received a divine command to forsake everything else and devote himself wholly to religion. He accordingly forsok his relations, equipped himself in a leathern doublet, and wandered from place to place, supporting himself as he could. Being discovered in the metropolis, his friends induced him to return; he, however, remained with them a very short time, resuming a life of itinerancy, in which he fasted much, walked abroad in retired places studying the Bible, and sometimes sat in a hollow tree for a day together. In 1648 he began to propagate his opinions, and commenced public preacher at Manchester; whence he soon after made excursions through the neighbouring counties, where he preached to the people in the market-places. About this time he began to adopt the peculiar language and manners of Quakerism, and experienced some of the persecutions to which all active novelty, in the way of religious opinion, was in those days exposed. At Derby the followers of Fox were first denominated *Quakers*, in consequence of their trembling mode of delivery, and calls on the magistracy to tremble before the Lord. In 1655 he was sent a prisoner to Cromwell, who, having ascertained the pacific tendency of his doctrines, had him set at liberty. He was, however, treated with great severity by the country magistracy, in consequence of his interruption of ministers during divine service, and exclamations in the churches, and was more than once obliged to the interference of the Protector for his freedom. On the occasion of a fast appointed on account of the persecution of the Protestants abroad, he addressed a paper to the heads and governors of the nation, in which he forcibly described the inconsistency of similar severity at home. In 1666 he set about forming the people who had followed his doctrines into a formal and united society. In 1669 he married the widow of Judge Fell, and soon after went to America, where he remained two years, which he employed in making proselytes. On his return he was thrown into Worcester jail, but was quickly released, and went to Holland. He soon after returned, and was cast in a suit for tithes, which he deemed it unlawful to pay. In 1684 he again visited the Continent, where he did not long remain; and his health becoming impaired by incessant toil, imprisonment, and suffering, he lived more retired until his death in 1691. Exclusive of a few separate pieces, the writings of Fox are collected into three vols. folio, the first of which contains his *Journal*, the second his *Epistles*, and the third his *Doctrinal Pieces*. He was undoubtedly a man of strong feeling and deep convictions; and William Penn speaks in high terms of his meekness, humility, and temperance.

FOX, JOHN, an English church historian, was born at Boston, in Lincolnshire, in 1517. At the age of sixteen he was entered at Brasenose College, Oxford, and in 1543 was elected a fellow of Magdalen College, in the same university. Applying himself to theology with great assiduity, he secretly became a convert to the principles of the Reformation. This tendency being at length suspected, a charge of heresy followed, and by the judgment of his college he was, in 1545, expelled. In the reign of Edward VI. he was restored to his fellowship; but in the reign of Mary, understanding that Gardiner was devising means to seize him, he went abroad, and gained a livelihood by correcting the press for an eminent printer at Basel, where he laid the first plan of his *Acts and Monuments of the Church*. On the accession of Elizabeth he returned to his native country, and was received in the most friendly manner by his

former pupil, the Duke of Norfolk, who maintained him as long as he lived, and settled a pension on him at his death. Secretary Cecil also obtained for him a prebend in the church of Salisbury; and he might have received much higher preferment if he would have subscribed to the articles enforced by the ecclesiastical commissioners. In 1575 a persecution took place of the Dutch Anabaptists, when Foxe sought an audience of Elizabeth, and endeavoured to convince her of the cruelty and injustice of condemning them to the flames. He died, greatly esteemed and lamented, in 1587, in his seventieth year. His principal work is the *History of the Acts and Monuments of the Church*, commonly called *Foxe's Book of Martyrs*, first printed in 1563, in one vol. folio; reprinted in 1632 and 1641 in three vols. folio. In 1684 it had reached the ninth edition.

FOXGLOVE. See DIGITALIS.

FOX-SHARK, or THRESHK. See SHARK.

FOXTAIL GRASS (*Alopecurus*), a genus of grasses belonging to the division of the order in which the spikelets are strictly one-flowered, and the inflorescence very close. It has a pair of very sharp glumes, compressed sideways, and a single pale, bearing an awn or beard at the back. The only species of agricultural value is the Meadow Foxtail (*A. pratensis*), a fibrous-rooted perennial forming a close herbage, and producing straw from 2 to 3 feet long. The sheath of the upper leaves is a little inflated; the ear is about 2 inches long, blunt, nearly cylindrical, and covered with silky hairs. The glumes are of equal length; the pale is of the same length, and much shorter than the projecting awn. It does not thrive on dry soils, but as it bears mowing well it is useful in the formation of lawns. An inexperienced observer may mistake for this the Field Foxtail (*A. agrestis*), a mere weed, very common in English meadows, but rarely found in Scotland. That plant is readily known by its straw being rough to the touch near the ear, by its having a slender tapering ear, and by the glumes having scarcely any silky hairs except at the back edge. One or two other species are known, such as the Black Foxtail (*A. nigricans*), a Russian plant, deriving its name from the dark colour of its ears; and the *A. Tauntoniensis*, which seems to be closely related to the last, but more productive.

FOY, MAXIMILIAN SEBASTIAN, a distinguished French general and orator, was born at Ham, Feb. 3, 1775, and was educated in the military school at La Fère. In 1791 he joined the volunteers who hastened to defend the frontiers of their country. In 1792 he served in the artillery in the army of the North, under the command of Dumouriez, and afterwards under Dampierre, Custine, Houchard, Jourdan, and Pichegru, and was wounded in the battle of Jemmapes. In 1794 the infamous Joseph Lebon, commissioner of the convention, caused him to be arrested, because Foy openly censured his excesses; the 9th Thermidor, however, saved his life. In the campaigns of 1795, 1796, and 1797 he served in the army of the Rhine and Moselle, distinguished himself particularly, in 1797, at the second passage of the Rhine, near Diersheim, and became the personal friend of Moreau—a circumstance which for some time operated unfavourably on his advancement. Towards the end of 1798 he served in Switzerland, under General Schauenburg, and in 1799 in the army of the Danube, under Masséna, where he assisted materially in the passage of the Limmath. In 1800 he was adjutant-general in the division of Moncey, in the army of the Rhine which marched through Switzerland into Italy, and commanded the vanguard of the army of Italy in the campaign of 1801, during which he defeated the enemy at the entrance of the

Tyrol. On the renewal of hostilities with Britain in 1803 he received the command of the floating batteries intended for the defence of the coasts of the Channel. In 1805 he commanded the artillery of the second division in the Austrian campaign. In 1807 Napoleon sent him to Turkey, at the head of 1200 artillerymen, to assist Sultan Selim against the Russians and British; but in consequence of the insurrection, in which Selim was dethroned, that corps returned to France. Colonel Foy, however, remained in Constantinople, and distinguished himself under the direction of the French ambassador, General Sebastiani, by the activity of his preparations for the defence of the Turkish capital and also of the Dardanelles. These were so effective that Duckworth, the British admiral, who approached the capital, was obliged to retire. From 1808 to 1812 Foy was general of division of the army in Portugal. July 21, 1812, after the defeat of the French at Salamanca, he succeeded Marmont as commander-in-chief, and conducted the retreat to the Douro. After Wellington had been obliged to raise the siege of Burgos, Oct. 21, 1812, General Foy advanced at the head of the right wing of the army of Portugal, and effected the passage of the Douro near Tordesillas, October 29. After the defeat of King Joseph and Jourdan at Vittoria, June 21, 1813, he collected 20,000 men at Bergara, beat back the left wing of the Spanish army, and defended every inch of ground, so that General Graham succeeded in carrying his position at Tolosa only after a most sanguinary conflict. General Foy, after reinforcing the garrison of St. Sebastian, retreated across the Bidasoa without loss. In the battles at Pampeluna and St. Jean-Pied-de-Port he commanded the left wing; and was present in all the battles of the Pyrenees, until he was dangerously wounded, Feb. 27, 1814. In 1814 and 1815 he was division-inspector of infantry. In the campaign of 1815 he commanded a division on the field of Waterloo, where he was wounded for the fifteenth time. In 1819 he was appointed division-inspector of infantry, and the same year was elected deputy by the department of the Aisne. A soldier, educated in the field, and covered with honourable scars, he now at once distinguished himself as an orator, and became the favourite of the nation. He always voted with the liberals, and proved himself the firm advocate of constitutional liberty. He distinguished himself particularly in the debates on the old laws of election, and those respecting the conscription, the war against Spain in 1823, and in all the debates on the guarantees of civil liberty. General Foy died November 23, 1825. Madame Foy published, from her husband's papers, a history of the Peninsular war, four vols. 8vo (translated into English). His *Discours* were likewise published after his death (*Discours du Général Foy, précédés d'une Notice biographique, par M. P. F. Tissot; d'un Éloge par M. Étienne; et d'un Essai sur l'Éloquence politique en France, par M. Jay, Paris, 1826, two vols. 8vo*).

FOYERS, FALLS OF, two romantic cataracts on the little river Foyers, Inverness-shire, which falls into Loch Ness, and within 1½ mile of its mouth. The upper fall is about 40 feet in height, twice broken in its descent, and a graceful bridge is thrown over the chasm. It is seen to the best advantage from the channel of the river below the bridge. The lower fall is described by Professor Wilson as the 'most magnificent cataract, out of all sight and hearing, in Great Britain'. Its height has been variously stated, but cannot be less than 160 feet. In volume of water it is inferior to the Falls of Clyde, but its wild and picturesque surroundings make it no less remarkable and impressive. The erection of an aluminium work near the falls, and the utilization of

their water-power for it, has, it is thought, to some extent marred the beauty of the scum.

FOYLE, a river of Ireland, formed by various streams which unite near Strabane, in the county of Tyrone. Hence it flows north, past St. Johnstown and Londonderry, 4 miles below which it falls into Lough Foyle. It is navigable for vessels of 800 tons up to Londonderry, but smaller vessels can ascend to Strabane, 12 miles farther up.—**LOUGH FOYLE**, the estuary of the river Foyle, runs into the land on the north coast of Ireland, between the counties of Derry and Donegal. It is 16 miles long, from north-east to south-west, 1 mile wide at its entrance, and 9 miles broad along its south side. It is only navigable along its west side, and a great part is dry at low-water.

FRA, an Italian prefix, derived from the word *frate*, brother, and used before the names of monks; for instance, *Fra Giovanni*, brother John. Some monks have become famous under such names, as Fra Bartolommeo, the painter, and Fra Paolo, the celebrated Venetian monk.

FRACASTORO, GIROLAMO, an ingenious poet and philosopher, was born in 1483 at Verona in Italy. It is said that he came into the world without a mouth, having in the place of it a small aperture, which was enlarged by a surgical operation. One day when his mother was carrying him in her arms, and walking in a garden, she was killed by lightning, and the child was uninjured. He was patronized by Cardinal Bembo, to whom he addressed the most celebrated of his works, a Latin poem entitled *Syphilis*. In the latter part of his life he wrote a poem on the adventures of the patriarch Joseph; but his poetic fire seems then to have been exhausted, and the virtues of the hero were less happily celebrated than the horrors of the disease. He died at Padua of apoplexy in 1553, aged seventy-one. Among the moderns who have exercised their talents in the composition of Latin verse, few have obtained higher reputation than Fracastoro. The elder Scaliger ranks him as a poet next to Virgil, and his merit has been generally acknowledged. Besides the poems already noticed, he wrote another, entitled *Alcon*, sive de Cura Canum venaticorum. Among his prose works on professional topics are treatises De Sympathia et Antipathia; De Contagione et Morbis contagiosis, &c.

FRACTION (from the Latin *frangere*, to break) signifies, in arithmetic and algebra, a combination of numbers representing one or more parts of a unit or integer: thus, four-fifths is a fraction, formed by dividing a unit into five equal parts, and taking one part four times. Fractions are divided into *vulgar* and *decimal*. Vulgar fractions are expressed by two numbers with a line between them. The lower, the *denominator*, indicates into how many equal parts the unit is divided; and the number above the line, called the *numerator*, indicates how many of such parts are taken; as, in $\frac{4}{5}$, 5 is the denominator, 4 the numerator. Vulgar fractions have been divided, though not very accurately, into *proper*, *improper*, *simple*, *compound*, and *mixed*, namely:—A *proper fraction* is a fraction in which the numerator is less than the denominator, as $\frac{3}{4}$, $\frac{5}{7}$, $\frac{1}{11}$, &c. An *improper fraction* is a fraction in which the numerator is equal to or greater than the denominator, as $\frac{5}{4}$, $\frac{7}{5}$, $\frac{11}{11}$, &c. A *simple fraction* consists of a single numerator and single denominator; and is either proper or improper, as $\frac{1}{11}$, $\frac{11}{11}$, &c. A *compound fraction* is a fraction consisting of two or more other fractions connected by the word *of*; thus $\frac{1}{2}$ of $\frac{3}{4}$, or $\frac{3}{8}$ of $\frac{1}{11}$ of $\frac{5}{7}$, &c., are compound fractions. A *complex fraction* is that whose numerator and denominator are

both fractions; thus $\frac{\frac{1}{2}}{\frac{3}{4}}$ is a complex fraction. An in-

teger and fraction together is called a *mixed number*; that is, $7\frac{1}{2}$, $9\frac{3}{4}$, &c., are mixed numbers. Decimal fractions include every fraction the denominator of which is ten or a power of it; as $\frac{1}{10}$, $\frac{1}{100}$, &c. Our beautiful system of writing numbers enables us to write decimal fractions without expressing the denominators, just as we are enabled to write whole numbers without saying whether they are units, hundreds, &c. The following scheme will explain it:—



The expression 540482.472807 is thus equivalent to 540482 $\frac{472807}{1000000}$. On the left of the point are the whole numbers; and just as every place in that series in proceeding to the left increases in value ten times, so every place to the right from the point decreases in value ten times. Writing decimal fractions is therefore only an extension of our system of writing whole numbers. Yet, though it is as simple as it is important, the system was unknown to the ancients, and was first discovered by the German mathematician Regiomontanus in 1464. All calculations in decimal fractions are very easy and simple. In working with decimals the integers are separated from the fractional numbers by a dot or period, so that this dot placed between several numbers is the characteristic sign of a decimal fraction. For instance, 5.36 is 5 whole numbers, 3 tenths, and 6 hundredths, or 36 hundredths.

FRACTURE (from *frango*, to break) is applied to the bones, and is divided into simple and compound; simple when the bone only is injured; compound when the soft coverings are so injured that either one of the fractured ends protrudes through the skin, or the skin and muscles are so lacerated as to expose the bone. The long cylindrical bones of the limbs are most frequently fractured; next the flat, particularly of the cranium (for those of the pelvis and scapula must be excluded); and, lastly, the round irregularly-shaped bones of the tarsus, carpus, and vertebrae. The bones are fractured by external violence, disease, and the action of the muscles. The long cylindrical bones are not unfrequently broken in more than one point; they are generally fractured at the centre of their shafts, in which case the fracture is more or less oblique, whereas, when it occurs near the extremities it becomes more and more transverse; hence fractures have been divided into oblique and transverse. The spongy bones are also fractured transversely; the flat bones in various directions, occasionally stellated. A comminuted fracture occurs when a bone is broken in different places at once, and divided into several fragments or splinters. Longitudinal fractures also occur to the long cylindrical bones. Complicated fractures are those accompanied with luxation, severe contusions, wounded blood-vessels, pregnancy, gout, scurvy, rickets, fragilitas ossium, and syphilis, which diseases prevent the union of the bones, and also cause them to be very easily broken. Bones become more brittle in old age. The superficial are more exposed to fracture than the deep-seated bones; thus the clavicle is more so than the os innominatum. Others, from their functions, are more exposed; as, for example the radius, from its affording support to the carpus. When a fracture takes place there is an effusion of blood from the ruptured vessels of the bone, periosteum, and contiguous soft parts; but there is also an exudation from the vessels round the seat of fracture of coagul-

able material. This material fills up the space between the broken ends of the bone and also surrounds the ends so as to form a clasp. It is practically material identical with that which exudes from the vessels in the neighbourhood of a wounded part, and which repairs the breach. It is material which consists largely of round white cells in a fibrinous fluid. After this material has been exuded, changes occur in the cells, and rapid proliferation occurs. As a result the material becomes firmer and fibrous, later it becomes converted into cartilage, and finally transformed into bone. The material thus formed to repair fracture is termed *callus*. The time which elapses before complete union has taken place varies with, among other things, the accuracy of adjustment of the displaced ends; therefore the necessity of early and careful setting. Usually four to ten weeks are sufficient for union. After this, however, further changes occur. The sheathing callus, that is the portion which clasps the broken ends, becomes gradually and to a considerable extent absorbed, projecting parts become rounded off, and so on. The treatment of a fractured bone consists in adjusting the separated ends as carefully and accurately together as possible, and then in maintaining them in this position by means of some immovable apparatus for the necessary length of time. The more speedily and successfully the bones are adjusted the more readily will union be effected.

FRA DIAVOLO, a celebrated Neapolitan brigand, whose real name was Michele Pezza. He was born in Calabria in 1760. He quitted the trade of stocking-weaving for the army, and served for a time in the Papal legion. He afterwards became a monk, but was expelled on account of misconduct. He then joined a troop of brigands, of which he became in a short time the leader. The government set a price upon his head; but when Cardinal Ruffo undertook to compel the French to evacuate Naples, Fra Diavolo was pardoned, was employed by the cardinal, and received a colonel's commission. At the head of his band he harassed the French, took refuge in Calabria after the conquest of Naples by Bonaparte, and incited the people against the French. He fell at last into their hands at San Severino in 1806 (his capture being effected by General Hugo, the father of the great poet). He was executed as a robber and incendiary. Scribe the dramatist, and Auber the composer, have made the name familiar; but the opera has nothing in common with the real Fra Diavolo except the name.

FRAME-BRIDGE, a bridge built of timber, &c. See Timber Bridge under article BRIDGE.

FRANC, a French silver coin, containing ten *deniers* and a hundred *centimes*. Value about $9\frac{1}{2}$ d.; or 25 francs = £1 sterling.

FRANCAVILLA, several places in Southern Italy. The most important is in the province of Otranto, occupies a height 14 miles w.s.w. of Brindisi; is well built, with a handsome parish church, a college, and several convents and hospitals, manufactures of woollen stuffs, cotton hosiery, earthenware, and snuff; and a considerable trade in wine, oil, and cotton. A great part of the town was destroyed by an earthquake in 1784. Pop. 15,943.

FRANCE (anciently *Gallia*), a maritime country in the west of Europe, forming one of its most extensive, most populous, and most influential states.

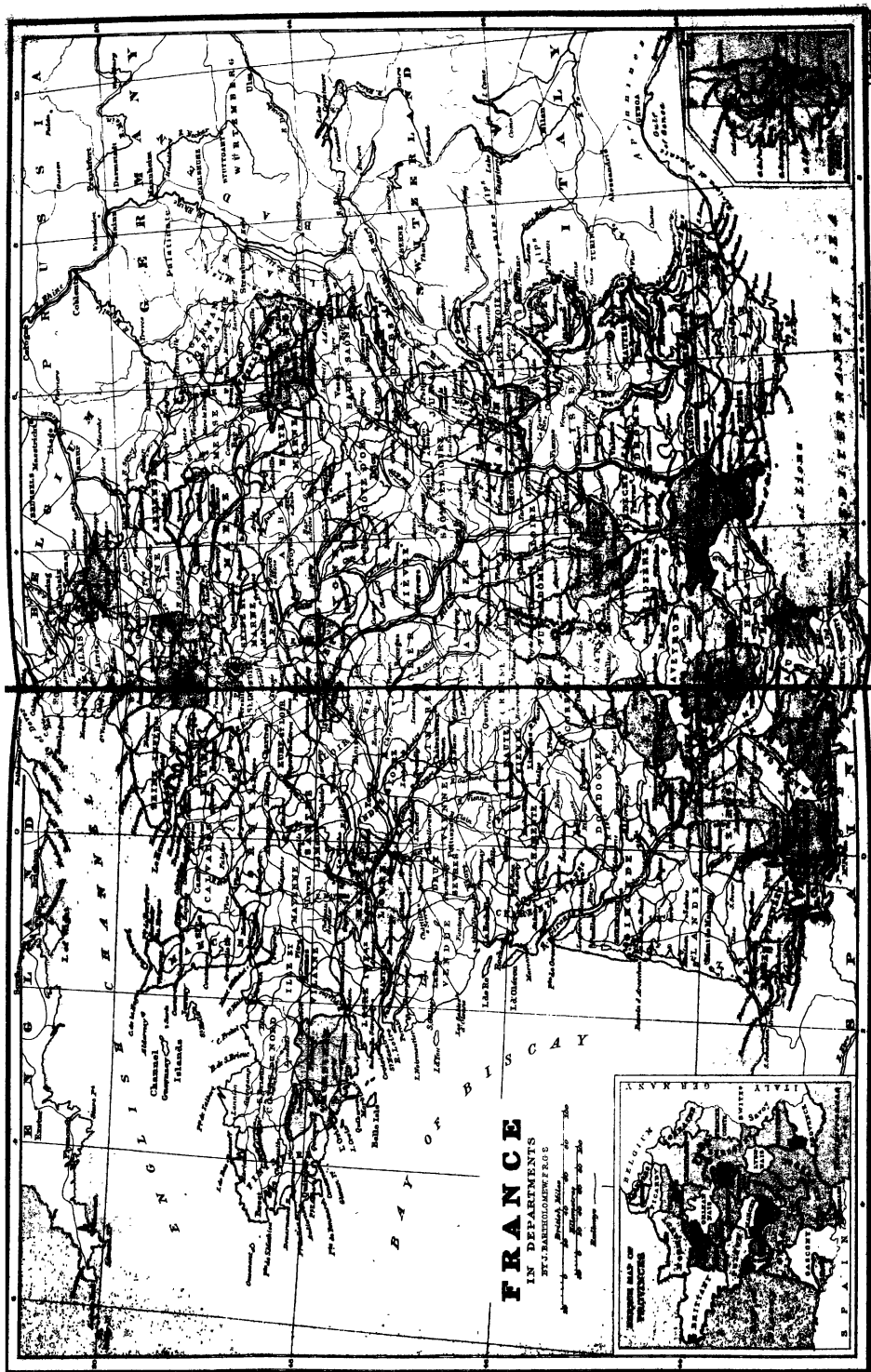
General Description.—France is situated between lat. $42^{\circ} 20'$ and $51^{\circ} 5' N.$; and lon. $4^{\circ} 50' W.$ and $7^{\circ} 40' E.$, and is bounded N. by the German Ocean and the Straits of Dover; N.W. by the English Channel; W. by the Atlantic, more especially that part of it called the Bay of Biscay; E. by Spain and the Mediterranean Sea; S. by Italy, Switzerland, and the Ger-

man territory of Alsace; N.E. by German Lorraine, Luxemburg, and Belgium. The longest lines which can be drawn across France are two diagonals, which intersect each other—the one from the south-east to the north-west extremities, 670 miles, and the other, from the south-west to the north-east extremities, 555 miles. Measured on the meridian of Dunkirk, the greatest length is 600 miles, and measured on the parallel of $48^{\circ} 20'$, the greatest breadth is 547 miles. The breadth near the centre is 400 miles, and along the parallel of $46^{\circ} 15'$, where it is narrowest, does not exceed 340 miles. The total area of France is 204,090 square miles. On taking a survey of this great country it is impossible not to be struck with the advantages it derives from its position. It not only forms a continuous and compact whole, but while protected by great natural barriers at most parts where it is connected with the continent, a long line of coast on the west and north-west gives it immediate access to the great ocean thoroughfare, while on the south its harbours in the Mediterranean secure to it a large share in the traffic of that most important of all inland seas.

Physical Features—Mountains, Rivers, and Lakes.

—France is traversed from south-west to north-east by several chains of mountains forming the general water-shed of the country. This water-shed has two slopes, the one towards the west and north, carrying its waters to the Bay of Biscay, the Atlantic Ocean, the English Channel and the German Ocean; the other towards the east and south, carrying its waters to the Mediterranean. The ranges of mountains and hills forming this water-shed include the western and central Pyrenees, the western Corbières in the department of Aude, the Cévennes, the mountains of Vivarais, Lyonnais, Beaujolais, and Charollais, the Côte d'Or, the Plateau de Langres, the Faucilles Mountains, and the Voges. This general water-shed is met towards the north-east by the eastern mountain ranges of France, namely, the Jura range and various Alpine ranges, one of the peaks of which is Mont Blanc, which may be regarded as the culminating point of the European mountains, although not absolutely the highest mountain in Europe. Near the centre of France, and separate from the great water-shed of the country, are several groups of volcanic mountains known by the general name of the Mountains of Auvergne, the chief peaks of which are the Plomb du Cantal in the southernmost group, the Puy de Sancy in the central group, and the Puy de Dôme in the northernmost group.

The spurs thrown off by the great water-shed divide France into six principal basins, five of which are on the north-western slope, and one on the south-eastern. These are.—1 The basin of the Garonne and its affluents (the Ariège, Tarn, Lot, and Dordogne on the right bank, and the Gers on the left bank). To this principal basin belong also the two secondary basins of the Charente on the north, and the Adour on the south. 2 To the north of the basin of the Garonne is that of the Loire and its tributaries (the Nièvre and the Maine on the right bank, and the Allier, Loiret, Cher, Indre, Vienne, and Sèvre Nantaise on the left). To this basin also belong the secondary basins of the Vilaine and the Blavet. 3 The basin of the Seine and its tributaries (the Aude, Marne, and Oise on the right bank, and the Yonne, Loing, Eure, and Rille on the left bank). The secondary basins are that of the Somme in the north, and those of the Orne and Oise in the south. 4 The basin of the Meuse and its tributaries (the Sambre on its left bank), to which is added the secondary basin of the Escaut or Scheldt. Only the southern portion of these two basins is included within the political boundaries of France. 5 The basin which pours a number of



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tributaries, the principal of which is the Moselle, into the Rhine. Only a comparatively small portion of this basin also is included within the political boundaries of France. 6. The basin of the Rhône, occupying the whole of the territory of France which lies to the south-east of the great water-shed. The tributaries of the Rhône are the Ain, the Saône, the Ardèche, and the Gard upon the right bank, and the Isère, Drôme, and Durance on the left. Only the lower part of the course of the Rhône is in France. The secondary basins are those of the Var, Argens, and Arc on the east, and those of the Tet, Aude, and Hérault on the west. France has in all more than 212 navigable streams, with a total navigation of 5700 miles.

The lakes are so few in number, and individually so limited in extent, as to be undeserving of separate notice. The largest, Grand-Lieu, in the department of Loire-Inférieure, covers an area of only 27 square miles, and is altogether devoid of interest. The next largest, St. Point, in the Jura, does not cover 3 square miles. Others of still less dimensions become more interesting from their localities in the lofty regions of the Pyrenees, or in the deep hollows of ancient craters in Auvergne.

Geology.—As might be anticipated from the extent of space which it occupies, France possesses all the geological formations in a greater or less degree of development. The mountains generally have a nucleus of granite, which accordingly forms a prevailing rock in the Alps, on the east frontier, and their branches south to the shores of the Mediterranean, in the Pyrenees, the Cevennes, and the elevated plateau of Langres. In the Vosges it is more sparingly developed, its place being often occupied by porphyry; and in the Jura, where limestone occurs in such enormous masses as to have given its name to a peculiar formation, it does not appear at all *in situ*, but, on the other hand, almost the whole of the extensive peninsula, including the old province of Brittany and part of those of Normandy and Poitou, is covered by it. The other crystalline rocks, consisting chiefly of trachytes and basalts, have received a magnificent development in Auvergne, where whole mountains are composed of them, and where the effects of remote volcanic agency are still presented to the eye in extinct craters and lava streams. The granite is overlaid by primitive stratified rocks of gneiss, and of micaceous and argillaceous slates, succeeded, particularly in the Pyrenees, by mountain limestone, which there assumes a form worthy of the name, and is found on Mont Perdu, full of its characteristic fossil shells, at the height of 10,230 feet above the level of the sea. The secondary formation, commencing with this limestone and continued in ascending series up to the chalk, always possesses peculiar interest, because within it valuable mines of lead and iron, and all the workable seams of coal, are included. It is largely developed in many parts of France, and furnishes a considerable number of coal and mineral fields, to which more particular reference will afterwards be made. The tertiary formation, including all the limestones, sands, and clays, above the chalk, occurs continuously in two great divisions, and partially in a number of isolated spots, and covers a vast extent of surface. The larger continuous division is in the south-west, where it commences at the foot of the Pyrenees, and occupies a very large portion of the basins of the Garonne and of the Adour. The lesser, but better known division, takes the name of the Paris basin, and has been made familiar to the scientific world by the labours of Cuvier and other distinguished naturalists. It occupies a large extent of space around Paris, and stretches south into the valley of the Loire. A considerable stretch of the same formation is found in the basin of

the Rhône, particularly along the east bank both of that river and its tributary the Saône. Of more recent alluvial formations, the only one particularly deserving of notice is the delta of the Rhône.

Climate.—The climate of France is greatly diversified, and cannot be described accurately without dividing it into different regions. But before mentioning these, it may be proper to observe, in general, that no country in Europe can boast of a climate superior to that of France. With a very limited exception, it lies wholly within the more moderate portion of the temperate zone, between the isothermal lines of 50° and 60°; and, consequently, with a mean annual temperature, the difference of which, at its north and south extremities, does not exceed 10°. France may be divided into four climatic regions according to the different vegetable products which different districts are able to mature. Within the first, and warmest, the olive is successfully cultivated. It forms the south-east part of France, and is chiefly confined to the departments which border on the Mediterranean. The second region is characterized by the general cultivation of maize or Indian corn. Its north limit is determined by a line drawn diagonally in an *E.N.E.* direction, from the department of Gironde to that of the Vosges. The third region reaches north to the extreme limit of the profitable culture of the vine, and may be considered as determined by a line stretching between the mouth of the Loire and the town of Mézières, in the department of Ardennes. All the country beyond this line is included in the fourth region. All of these regions, notwithstanding their diversities of temperature, are generally healthy. In the north-west the prevalence of winds from that direction often produces a superfluity of moisture, which manifests itself in mists or in frequent and heavy showers of rain. At the opposite extremity, the south-east, a contrary effect is produced, and a sultry, stifling wind wrinkles up the skin, and not unfrequently spreads fever in its most malignant form. But it is only to a few exceptional districts that these remarks apply. After allowing for them, more than four-fifths of the surface remains, under an atmosphere remarkable, more especially in its central districts, for salubrity, serenity, and brightness.

Political Divisions.—Before the revolution of 1789 France was divided into general governments, or provinces, as they are usually called, although by some writers this latter term is reserved for the ancient feudal territories into which France was divided in the middle ages. The number of these general governments has varied at different epochs. Under Francis I., by whom they were instituted, there were nine, namely, Normandy, Guyenne, Languedoc, Provence, Dauphiné, Bourgogne, Champagne-et-Brie, Picardie, Ile-de-France. Under Henry III. there were twelve, formed by the addition of Bretagne, Orléanaise, and Lyonnaise. Under Louis XIV. the number was fixed at thirty-two, to which a thirty-third was added by the acquisition of Corsica, under Louis XV. In 1789, when the love of change became paramount, the provinces were not permitted to escape; and it was then determined that the whole of France, including the island of Corsica, should be parcelled out into departments, and each department subdivided successively into *arrondissements*, *cantons*, and *communes*, an arrangement which was actually carried out in 1790. This division has since maintained its ground, and perhaps deserves it, because, instead of being merely an artificial nomenclature, it has the merit of being a kind of natural classification—each department being named after the most important physical feature which it contains; and thus furnishing, in the name, some know-

ledge of the space which it designates. The number of departments was originally eighty-three, but it has been at different times increased and decreased. There are now eighty-seven departments, the last formed being Haut-Rhin (Belfort). As the old provinces, though no longer recognized in legal and other formal documents, continue so familiar to the French themselves, and are so frequently mentioned, not only by earlier writers, but in the geographical, historical, and statistical works of the present day, a table is here given exhibiting these provinces in alphabetical order, and in parallel columns, the chief town in each, and the departments most nearly corresponding to them:—

Provinces.	Departments	Capitals of Provinces.
Alsace . . .	(Now German, except Belfort, or dep Haut-Rhin) . . .	Strasbourg (German).
Anjou . . .	Maine-et-Loire . . .	Angers.
Artois . . .	Inland or south-eastern portion of Pas-de-Calais . . .	Arras.
Aunis . . .	Maritime part of Charente-Inférieure . . .	La Rochelle.
Auvergne . . .	Puy-de-Dôme and Cantal . . .	Clermont.
Étarn-et-Navarre . . .	Basses-Pyrénées . . .	Pau.
Berry . . .	Cher, Indre . . .	Bourges.
Bourbonnais . . .	Allier . . .	Moulins.
Bourgogne . . .	Alu, Côte-d'Or, Saône-et-Loire, Yonne . . .	Dijon.
Bretagne . . .	Côtes-du-Nord, Finistère, Ille-et-Vilaine, Loire-Inférieure, Morbihan . . .	Rennes.
Champagne . . .	Ardennes, Aube, Marne, Haute-Marne . . .	Troyes.
Corica . . .	Corse . . .	Ajaccio.
Dauphiné . . .	Hautes-Alpes, Drôme, Isère . . .	Grenoble.
Flandre . . .	Nord . . .	Lille.
Folk . . .	Artois . . .	Fox.
Franchie Comté . . .	Doubs, Jura, Haute-Saône . . .	Besançon.
Gasconne-et-Guyenne . . .	Aveyron, Dordogne, Gers, Girondet, Lot, Lot-et-Garonne, Landes, Hautes-Pyrénées, Tarn-et-Garonne . . .	Bordeaux.
Ile de France . . .	Oise, Seine, Seine-et-Oise, Seine-et-Marne, southern part of Aisne . . .	Paris.
Languedoc . . .	Ardèche, Aude, Gard, Hérault, Haute-Garonne, Haute-Loire, Lozère, Tarn . . .	Toulouse.
Limousin . . .	Corrèze, Haute-Vienne . . .	Limoges.
Lorraine . . .	Meuse, Vosges, Meurthe-et-Moselle (and German Lorraine) . . .	Nancy.
Lyonnais . . .	Loire, Rhône . . .	Lyon.
Maine . . .	Mayenne, Sarthe . . .	Le Mans.
Marche . . .	Creuse . . .	Guéret.
Nivernais . . .	Nièvre . . .	Nevers.
Normandie . . .	Calvados, Eure, Manche, Orne, Seine-Inférieure . . .	Rouen.
Orléanais . . .	Eure-et-Loire, Loiret, Loir-et-Cher . . .	Orléans.
Picardie . . .	Somme, maritime part of Pas-de-Calais, N. part of Aisne . . .	Amiens.
Poitou . . .	Deux-Sèvres, Vendée, Vienne . . .	Poitiers.
Provence . . .	Basses-Alpes, Bouches-du-Rhône, Var, eastern part of Vaucluse . . .	Aix.
Roussillon . . .	Pyrénées-Orientales . . .	Perpignan.
Saintonge and Angoumois . . .	Charente and eastern or inland part of Charente-Inf. . .	Angoulême.
Touraine . . .	Indre-et-Loire . . .	Tours.

The following territories have been acquired since 1790:—

Territories.	Departments.
Avignon and Venaissin (including Orange previously acquired) . . .	Part of Vaucluse.
Nice . . .	Alpes-Maritimes.
Savoie . . .	Savoie, Haute-Savoie.

Agriculture, &c.—About nine-tenths of the soil of France is productive, and about one-half of the whole French territory is under the plough. To secure the productiveness of the land thus occupied, it has been seen that nothing is wanting to the climate; and the soil, taken as a whole, is of at least medium fertility. In regard to the management of arable land, the French are still far behind the English, but have nevertheless made great advances during the nine-

teenth century. During the period 1841-95 the production of cereals in France has increased by nearly 70 per cent, while the extent of land under cereals increased by only one-quarter. This is equivalent to saying that the productiveness of the soil has increased in that time by fully one-third, a result attributable partly to increased assiduity in cultivation, but chiefly to the use of improved implements, and the adoption of better agricultural methods. The improvement of agriculture is a matter which receives direct attention from the government. Every *arrondissement* has an agricultural chamber, the members of which are appointed by the sub-prefect, and this chamber meets every year, and draws up reports and offers suggestions. Nevertheless, agriculture in France, though advancing, is not keeping pace in its advance with many other parts of the Continent; and it is generally believed that this state of matters is to a large extent due to the almost endless subdivision of property, which necessarily results from the French law of succession, by which all children inherit equally. The cereals forming the great bulk of the cultivated crops are wheat, oats, rye, and barley. The crops next in importance to these are meslin or mixed corn (*meteil*), potatoes, hemp, rape, maize, buckwheat, flax, and beet. This last plant is cultivated extensively in some departments, especially in that of Nord, for the manufacture of sugar. The most valuable crops of which the cultivation on a great scale is not general, but confined to particular districts, are madder, tobacco, saffron, and hops. The cultivation of tobacco is monopolized by the government, and is confined to certain departments. It yields an annual gross revenue to the government of about £15,000,000 or £16,000,000, but from this total there falls to be deducted the expense incurred in the cultivation and manufacture of the tobacco. In France the grass is on a much more limited scale than the arable husbandry, the land in permanent meadow being in extent only one-sixth of that under the plough. This contrasts strikingly with England, where the grass land exceeds the arable. The breeding of stock, notwithstanding the stimulus afforded by the establishment of numerous societies, general and local, for its encouragement, is, in France, if not imperfectly understood, very indifferently practised. The races of oxen, instead of being confined to a few of the more perfect types, are almost as various as the different districts into which the country is divided, and include a few good breeds, particularly in the rich plains of Lower Normandy, with many more of the most inferior description. The rearing of sheep is more successful, and though the improvement of the carcass, by imparting to it the best feeding properties, continues to be too much overlooked, the fleece has in many districts been carefully and skillfully improved, and much wool, scarcely inferior to that of the merino, is raised. The general employment of cattle for agricultural purposes gives little encouragement to the rearing of draught horses; but the warlike propensities of the nation have always created an extensive demand for horses of a description adapted both for heavy and light cavalry. Considerable pains have been taken to improve such breeds, by the establishment of government studs, and the rearing of them is extensively and successfully carried on. Asses and mules, generally of a superior description, are much used in France.

The cultivation of the vine is one of the most important branches of French agriculture. The total quantity of land in vineyards is nearly a twenty-fifth of the whole surface; but as there are extensive and continuous districts where there are no vineyards, the proportion which vine-land on the districts properly

adapted to it bears to the whole land under cultivation, attains a much higher ratio. There are seventy-five departments in which the vine is cultivated more or less, but three-fourths of the production are obtained from about thirty departments. In everything relating to this branch of culture the French are unsurpassed. The various first-class wines which they produce, under the name of Champagne, Burgundy, Bordeaux, &c., are in high repute and general demand over all Europe. The departments in which the greatest extent of land is occupied by vineyards are the Gironde, Charente-Inférieure, Hérault, Charente, Dordogne, Gers, Gard, Lot-et-Garonne, and Var; but the departments of Marne and Aube, forming the ancient province of Champagne, and those of Côte-d'Or and Saône-et-Loire, comprised in Burgundy, though yielding a less quantity of wine than others, are highly distinguished for the superior quality of their products. Gironde furnishes the wines properly understood by the name of *claret*. A fifth part of the Bordelais wines is used for the distillation of brandy; but they are inferior for this purpose to those of the Charente, which supply the famous Cognac brandy. In the year 1899 France exported to Great Britain 6,002,420 gallons of wine, of the declared value of £2,963,757. A large part of the wealth of France consists in its fruits. Among the most important fruit-trees cultivated in France are the apple, the fruit of which, in the northern districts, particularly in Normandy, is largely used for the manufacture of cider; the chestnut, which, in the somewhat barren districts of Central France (Limousin, Cevennes, Auvergne, Périgord, Vivarais), yields an article of food which takes the place of the cereals among the poorer classes; the mulberry-tree, cultivated in eight or ten departments in the south-east (especially in Gard and Ardèche), both for its fruit and its leaves, the leaves being used as food for the silkworms, on which the French silk manufacture depends; the olive, which grows in the same districts as the mulberry, but is principally cultivated in the department of Var; the pear, plum, cherry, apricot, peach, orange, citron, fig, almond, &c.

The forests of France occupy about one-seventh part of the whole territory. Their principal localities are the Ardennes, Vosges, and Plateau de Langres, in the north-east; the Jura in the east; and the mountains of Auvergne in the centre. The two loftiest of the French mountain-ranges, the Alps and the Pyrenees, are comparatively poor in wood. Isolated forests exist in various other quarters, as at Compiègne, Villers-Cotterêts, Halatte, Chantilly, Fontainebleau, the mouth of the Seine, and in the Landes along the Bay of Biscay. In the last-mentioned locality a forest of sea-pine, about 100 miles long by 7 miles broad, has been formed, which not only furnishes good timber, &c., but serves the important purpose of protecting a large tract from clouds and whirlwinds of sand which must soon have converted it into a desert. The chief constituents of French forests are the oak, the elm, the pine, the fir, the larch, the birch, the beech. The total gross revenue from forests was estimated in the budget of 1899 to amount to 60,865,370 francs (£2,484,615).

Minerals.—The coal-fields of France are so numerous that coal-pits exist in no fewer than thirty-three departments; but most of these are very limited in extent. Several of the smaller fields occur in the north-west, and also in the south, where both anthracite and lignite are found; but the fields whose importance entitle them to particular notice are only two—that of Valenciennes in the north-east, forming the western extremity of the great Belgian coal-field, and that of

St. Étienne, to which the manufactures of that town, Lyons, and the surrounding districts, are indebted for much of their prosperity. The annual output is over 30,000,000 tons, but falls so far short of the annual consumption, that a large import takes place from England and Belgium, particularly the latter, and wood continues to be the common fuel throughout France, at least for domestic purposes. The coal-fields contain seams of iron, which are extensively worked, and furnish ore to a great number of blast-furnaces; but the chief supply to these works appears to be derived not from them, but partly from alluvial beds, in which the ore occurs in the form of balls, especially in the departments of Ardennes, Moselle, Haute-Marne, Haute-Saône, Nièvre, Cher, &c., partly from seams occurring in profusion among the strata of the Jura limestone, particularly on the western slope of that mountain chain, and partly from the veins of iron diffused among the crystalline and primitive rocks, chiefly of the Alps, Pyrenees, and Vosges. Though the number of mines actually worked is great, the quantity of foundry pig annually produced is only about 2,500,000 tons. Few countries have been said to be so rich in lead as France. It occurs in greater or less quantity in a great number of districts, and is generally argentiferous. It would seem, however, that the richness of the seams is not in proportion to their number, as the working of it is confined to a few particular spots in the departments of Puy-de-Dôme, Lozère, Hautes-Alpes, and Ile-et-Vilaine. The mines formerly worked in the department of Finistère are now closed. Manganese is very widely diffused, but is worked only in a few mines, of which the most important is that of Romandèche, department Saône-et-Loire. Gold exists both in the sands of rivers and *in situ* in thin streaks embedded in quartz. Attempts have been made to work it, but not with success. A vein of quicksilver was opened about the middle of the 18th century, and was worked successfully for twelve years, and then abandoned. Zinc, copper, arsenic, nickel, and cobalt exist, but not in such quantities as to be workable to profit. The principal saline substances are alum and common salt. The former occurs extensively in bituminous schists abounding with iron pyrites, and is worked in seven departments; the latter occurs in the form of rock-salt, both in the *v.x.* departments and in the Pyrenees, and is worked to the average extent annually of about 580,000 tons. (But the great sources from which salt is derived are the lagoons and salt marshes which line many parts of the coast. Of these the produce is about 300,000 tons. A large revenue is also derived from quarries, and valuable beds of common clay, fine potter's earth, and kaolin.)

Manufactures.—The most important manufacture is silk, which, in a great variety of forms, plain and figured, has its principal locality at Lyons and the towns of the surrounding districts, particularly St. Étienne; and is also manufactured, though to an inferior extent, at Paris, Nîmes, Avignon, Annonay, Tournai, and other places. The declared value of the silk manufactured goods exported to the United Kingdom in 1880, was £9,588,663; 1894, £8,774,495; 1899, £11,805,225. After it, though at a considerable distance, follow cotton stuffs, pure and mixed, at Amiens, Rouen, St. Quentin, Troyes, Lille, &c.; woollens, including broad-cloths, at Louviers, Elbeuf, Sedan, &c.; lighter woollen stuffs at Roubaix, Tourcoing, Lille, and Rheims; carpets at Paris, Aubusson, Felletin, and Abbeville; and tapestry at Paris and Beauvais; linens, including fine muslin, gauze, and lace, at Valenciennes, Courtray, St. Quentin, Alençon, Caen, &c.; porcelain at Sevres, Paris, Limoges, and Bayeux;

stoneware at Nevers, Montereau, &c.; and common pottery at Paris, Nevers, and elsewhere; beet root sugar, chiefly in the department of Nord; leather, and the various articles made of it, including gloves; paper, plain and stained; hats, hosiery, steel, iron, brass, and zinc ware, plate and flint glass, &c. Besides these, a great number of articles in which skill, taste, and ingenuity are more especially required, have their common seat in the capital. Among others may be mentioned jewelry, clocks, surgical and mathematical instruments, carriages, works in ivory, printing type, and engravings.

Commerce and Shipping.—The commerce is usually divided into internal and external. The former is unquestionably the larger of the two, but its amount cannot be ascertained with any degree of exactness. The principal towns of the interior, constituting the centres from which it emanates, are Paris, Lyons, Rouen, Lille, St. Étienne, Toulouse, Nîmes, Nancy, Perpignan, &c. In 1898 the imports for home consumption, exclusive of the precious metals, amounted to £175,647,800, while in 1888-97 they averaged about £164,000,000; the exports of native products and manufactures amounted in 1898 to £140,126,680, and in 1888-97 averaged £137,688,800. The foreign commerce is chiefly with Great Britain, Belgium, Germany, and Italy. Britain is far ahead of the others, its imports from France being £53,000,788 in 1899, while its exports to France amounted to £22,277,012; the former consist chiefly of butter, eggs, grain, silks, wine and brandy, woollens, and sugar; the latter chiefly of wool and woollens, cottons and cotton, coal, machinery, and metals. A consular report published in 1899 states that the total value of exports and imports together in 1898 represented a sum amounting to £815,174,500, as compared with £327,000,000 in 1890. The imports of food-stuffs in 1898 were valued at £57,352,350, as against £56,940,360 in 1890. The exports of raw materials were worth about £29,550,000 in the same year, while the value of the imports of raw material for manufacture was £81,387,400, as against £91,000,000 in 1890. The export of manufactured goods in 1898 was £64,057,200, while in 1890 it was £76,782,000. On the other hand, the imports of manufactured goods fell from £24,275,680 in 1890 to £21,596,800 in 1898. The opponents of protective tariffs adduce the recent returns of French trade in support of their position.

In the year 1899, the merchant navy of France included 16,615 vessels of 2 tons and upwards, with a total tonnage of 900,283 tons; and the number of steamers alone was 1209 of 485,615 tons. In 1898 the number of vessels entered in the foreign trade at French ports was 29,498; tonnage, 16,562,244 tons; the total cleared 30,315 of 17,001,608 tons. Of those entered 8583 of 4,611,561 tons, and of those cleared 9024 of 4,925,265 tons were French.

Canals, Roads, Railways, Post-office, &c.—The canals are numerous, and furnish signal displays of engineering skill. The Canal du Midi, or, as it is sometimes called, the Canal of Languedoc, starting from a point in the Garonne a little below Toulouse, is continued in an e.s.w. direction into the lagoon of Thau, and thereby gives a continuous navigable communication between the Atlantic and the Mediterranean, in the line of the important towns of Bordeaux, Agen, Toulouse, Carcassonne, and Narbonne. In like manner three separate canals cut across the basin of the Rhone; the Canal du Centre, or of Charollais, which commences at Châlons-sur-Saône, and proceeds to Digoin, on the Loire; the Rhone and Rhine Canal, so called from uniting these two rivers, partly by the intervention of the Doubs; and the Canal of Burgundy, which, proceeding also from the

Saône, communicates with the Yonne, and through it with the Seine. The effect of these three canals is to break down the barriers which isolate the basins of the Rhone, Loire, Seine, and Rhine, and give navigable access from any one of them into the other three. The roads of France are usually classified under the heads of Great or National Roads and Department Roads. Besides these there are a great number of country or district roads, (*chemins vicinaux*), the length of which is unknown. The railways in France partly belong to the state, and partly have been granted to private companies for a limited period, at the end of which they become state property. There are also certain local lines which at the end of a fixed period come into the possession of the departments. On the 1st of January, 1900, there were in France 26,353 miles of railway in operation, of which 1800 miles were described as government lines, while about 2750 miles were described as local lines. In 1898 the total number of letters, book-packets, &c., that passed through the French post-office was 2,208,269,000. The total length of telegraph lines in France in 1899 was 64,422 miles, and of wires 208,823 miles. The total number of inland messages is about 37,000,000; of international messages about 6,000,000. According to the budget of 1899 the total gross revenue to be derived from the post-office service in that year was estimated at about £9,400,000, including telegraphs and telephones.

Administration of Justice.—In accordance with the general arrangement which divides the whole country into departments, each department into *arrondissements*, each *arrondissement* into *cantons*, and each *canton* into *communes*, there is a series of courts, commencing with the lowest of these divisions, and rising above each other in regular order. First, each *commune* has a justice of peace (*juge de paix*), who judges in petty causes, but whose more appropriate function is understood to be to act as a kind of umpire between parties at variance, and induce them to settle their differences without proceeding to formal litigation. If the attempt at conciliation fails, the complainant brings his action before a court which, from being that in which the action must originate, receives the name of court of primary or first jurisdiction or resort (*tribunal de première instance*). Every *arrondissement* has such a court, and has, moreover, if any more important trading town is situated within it, a *tribunal de commerce*, to which mercantile and commercial causes are appropriated. It has also, occasionally, a court called *conseil de prud'hommes*, in which persons of skill and character, not vested with ordinary legal functions, settle disputes on principles of equity, and pretty much in the character of arbitrators. From these courts of primary resort an appeal lies to a number of courts called *cours d'appel*. They are in all twenty-seven, and have each jurisdiction over several departments. These courts generally hold their sittings in the most important town situated within their jurisdiction. The *tribunaux de commerce* in the most important commercial and manufacturing towns consist of members who are elected by the chief business men of the respective places. Above all these courts, and properly the only supreme court of the state, is the *cour de cassation*, so called from its power of reviewing and annulling the decrees of inferior courts. It sits in the capital.

Instruction and Public Worship.—In France education in all its branches has long been taken under the special cognizance of the state, and the superintendence of it is expressly committed to a high functionary, who takes the name of minister of public instruction. The principal educational establishments

are classed under three heads—primary, secondary, and superior. At the head stands the university, which is very different from other universities, and embraces the *facultés* or university colleges scattered over the whole of France in the principal towns. These are also connected with the different *académies* or educational centres, of which there are sixteen in France, each comprising so many of the departments. The *académie* of Lille, for instance, embraces the five departments of Nord, Aisne, Ardennes, Pas-de-Calais, and Somme, and besides the *facultés* for university education, there are *lycées* for secondary education, normal schools, and other schools under the superintendence of this educational centre. At the institutions known as *facultés*, the education given, as in the best modern universities, is of the highest description, and need not be particularized. Secondary education is given chiefly in the *lycées* or lycœums and in the *collèges*, there being institutions of both kinds for girls as well as for boys. Primary instruction is intended for the whole population, attendance at the primary schools being compulsory and the education free. The public schools are now all under the charge of laymen. There are still numerous private schools and institutions, however, many of which are managed by the clergy and religious bodies, but in all cases children have to undergo a public examination. (See SCHOOLS.) Religion, in like manner, is taken under the cognizance of the state, and falls within the province of a special minister. The state places all forms of religion on an equal footing, and professes to deal impartially with all by paying salaries to their ministers. With the quality of the particular religion, therefore, the state concerns itself no further than simply to know that it is not obviously subversive of social order or good morals. The Roman Catholics form about 78½ per cent of the total population, the Protestants less than 2; many profess no religion.

Army.—By the law of 1872, which has been supplemented down to 1892, personal military service is declared to be obligatory. Every Frenchman twenty years old and not unfit for military service, must serve, first in the regular army (*armée active*) for three years, then in the reserve of the regular army for ten years, next in the territorial army for six years, and finally in the reserve of the territorial army for six years. By the law of the 24th of July, 1873, referring to the organization of the army, the territory of France is divided into eighteen regions, each of which is again subdivided. Each region is occupied by a *corps d'armée*, and there is also a *corps d'armée* assigned to Algeria. Each region has general stores, and each subdivision has one or more special stores supplied from the general ones. Each *corps d'armée* comprises two divisions of infantry, one brigade of cavalry, one brigade of artillery, one company of engineers, one rifle battalion, field-batteries, bridge train, &c. The active army and its reserves are distributed all over France, but the territorial army and its reserves are confined to fixed areas. In 1899 the total strength of the regular army on a peace footing amounted to 616,092 men, of whom 580,881 were infantry, 76,181 cavalry, 81,527 artillery, 13,426 engineers, 20,700 staff and administration, 11,418 military train, and 22,861 gendarmes.

Navy.—At the beginning of 1899 the French navy was possessed of 20 first-class battle ships, 11 second-class, and 7 third-class; 14 port-defence ships; 51 first, second, and third class cruisers; 250 torpedo boats, and 23 torpedo gunboats. These numbers include ships in course of building, but exclude transports and non-service vessels. The navy is manned partly by conscription and partly by voluntary enlistment.

Revenue and Debt.—France has now a larger revenue, expenditure, and public debt than any other country in the world. The revenue for 1899 was estimated at £189,000,000; expenditure, £188,968,000. The total debt is estimated at £1,244,000,000, including a floating debt of £46,000,000.

Constitution.—France has been a republic since the overthrow of the second empire by a Paris mob on the 4th of September, 1870. The details of the constitution were fixed by a law dated the 25th of February, 1875, and several amendments have been enacted in subsequent years. This law places the legislative authority in the hands of a National Assembly composed of two chambers, the chamber of deputies and the senate. The chamber of deputies consists of 584 members representing the arrondissements, and the members are elected for four years by universal suffrage. The senate consists of 300 members, who must be forty years of age at least. They are elected by special bodies of delegates for nine years, one-third retiring every three years. The head of the government is a president, elected for seven years by a majority of votes of the members of the two chambers sitting as one National Assembly. No one can be a member of this body who has not undergone the legal military training.

Weights, Measures, and Money.—As an account of the present system of weights, measures, and moneys in France is contained in the article DECIMAL SYSTEM, all that is necessary here is to give some information regarding the weights, &c., formerly in use. The old measures of length were:—The *toise* or fathom of France equal to 6 Parisian feet, the foot to 12 inches French, and the inch to 12 lines, each subdivided into 12 points. 76 Parisian feet are nearly equal to 81 English feet, or, more accurately, 40,000 Parisian feet, inches, or lines, equal 42,630 English feet, inches, or lines. Thus 1 Parisian foot equals 1·065765 English, or 12·78918 English inches, so that the *toise* is equal to 6·39 English feet. Hence also 1 English foot equals 11·26 French inches. The Paris *aune* was 46·78 English inches. In the old French road-measure the term *lieue*, or league, was applied to three principal measures. The first was the legal or posting league, which was equal to 2 French miles, each mile 1000 *toises*, hence equal to 2 English miles 3 furlongs and 15 poles. The second is the marine league (20 to a degree), equal to 2855 *toises* or 6076 English yards. And the third is the astronomical league (25 to a degree), equal to 4860 English yards. The *arpent*, or acre of land, contained in general 100 square *perches*; but the *perche* varied in different provinces. The Paris *arpent* contained 900 square *toises*, and the royal *arpent* 1544 square *toises*. The old French weight for gold and silver, called *poids de marc*, makes the pound or *livre* contain 2 *marcs*, 16 *onces*, 128 *grs*, 884 *deniers*, or 9216 *grains*, equal to 7500 grains troy. The French *marc* = 3750 grains troy. For commercial weight the *poids de marc* was likewise used, and the *quintal* of 100 *livres* = 108 lbs. *avoirdupois* very nearly. Weights and measures, however, varied considerably in the different provinces. Corn measure was: the *muil* of 12 *setiers*, 24 *mines*, 48 *minots*, or 144 *boisseaux*. The *muil* was of different weight according to the grain measured, and the other weights varied with it. Thus for barley and wheat it was 1875 *livres*; for oats, 3746 *livres*; for salt, 2497 *livres*, &c. Wine measure was the *muil* of 36 *setiers*, 144 *quartiers*, or 288 *pinces*. For liquid measure the *muil* was equal to 268 *livres*. See DECIMAL SYSTEM.

The unit of the old French money system was the *livre*. Before 1667 there were two *livres* coined. The one was the *livre tournois*, so called because it was struck at Tours. It was divided into 20 *sous*,

and each sou into 4 *liards* or 12 *deniers*. In the year mentioned the use of this livre was rendered general throughout the kingdom. The other was the *livre parisis*, equal in value to 25 *sous tournois*, but nevertheless divided in the same way as the latter. This was suppressed at the same time that the use of the other was made general. The livre tournois remained the monetary unit in France till the introduction of the decimal system in 1795. At that period the value of the livre was very nearly equal to that of the franc, which then came into use, 81 livres being about equal to 80 francs. Before 1795 the following multiples of the livre were also in use: the *louis d'or*=24 livres; the *pistole*=10 livres; the large crown (*gros écu*)=6 livres; the small crown (*petit écu*)=3 livres.

A number of the denominations properly belonging to the old system of weights, measures, &c., are still used in France, and applied to values derived from the decimal system. For example, a millimètre is sometimes called a *trait* or line, a *decimètre* a *perche*, and the third of a mètre is called a *piéd usuel*. Similarly, in the square measure a *hectare* is sometimes called an *arpent*; and in the liquid measure the *hectolitre* sometimes receives the name of *setier*, and the *kilolitre* that of *muid*.

Extent of Empire.—In addition to its European territory France possesses extensive tracts in Asia and Africa, with smaller possessions in America and Oceania. These, with their area and population in 1896, are exhibited in the following table:—

	Area in sq. miles	Population.
FRANCE	204,092	38,517,975
IN AFRICA—		
Algeria and Algerian Sahara	307,974	4,480,000
Tunis	50,840	1,500,000
Sahara Region	1,684,000	2,500,000
Senegal	115,800	2,000,000
Western Sudan	250,190	4,900,000
Ivory Coast, &c.	64,420	650,000
Dahomey	14,140	600,000
French Congo	498,920	8,950,000
Bagirmi	65,050	1,000,000
Obock and Somali Coast	8,940	30,000
Ile de Réunion	970	171,720
Comoro Isles	620	53,000
Mayotte	148	8,700
Nossi-Bé	113	7,800
St. Marie	84	7,670
Madagascar	227,760	3,500,000
IN ASIA—		
French India	197	236,910
French Cochín-China	22,950	2,085,000
Cambodia	46,000	1,500,000
Anam	81,000	6,000,000
Tonquin and Laos	125,000	12,000,000
IN AMERICA—		
French Guiana	46,850	22,710
Martinique	380	187,690
Guadeloupe and dependencies	698	167,100
St. Pierre and Miquelon	93	6,250
IN OCEANIA—		
New Caledonia and dependencies	7,630	51,000
Tahiti, Marquises, and other islands	1,405	22,380
Wallis Archipelago, &c.	100	5,000
Total	3,834,419	91,160,905

HISTORY.—France or Gaul, at the earliest period of which anything is known with regard to it, was inhabited by three or four hundred independent tribes, divided into three great families, the Celts or Gauls, the Iberians or Vasconians, and the Belgæ. The Iberians appear to have been the earliest settlers, and to have entered the country by way of Africa and Spain. Before the arrival of the Celts it is probable that the Iberian tribes had spread a considerable distance northwards into the heart of France, but they were gradually driven southwards by the new settlers, until at the time of Julius Cæsar they occupied, under

the name of Aquitanians (Aquitani), only the southwestern portion of Gaul lying between the Pyrenees and the river Garonne (Garumna). It was these people who gave their name to two of the great provinces of south-western France, Aquitaine or Guyenne (Aquitania) and Gascony (Vasconia); and it is their descendants who still inhabit the Basque provinces in the north of Spain, and speak a language (the Basque) which has no discoverable affinities with any other human tongue. The Belgæ appear to have been the latest settlers in Gaul. They inhabited the northern part, and were separated from the Galli by the rivers Seine and Marne. Besides these three races, who occupied extensive tracts of territory in Gaul, there were other two peoples who, long before the Roman period, made local settlements in the parts adjoining the Mediterranean. These were the Phœnicians and the Greeks, both of whom had commercial objects in view. The Phœnicians came first and planted some colonies in the interior, in the valley of the Rhône; but they were ultimately supplanted by the Greeks. Some Rhodian colonists established themselves at the mouths of the Rhône, while the Phœnician colonies in the interior fell into the hands of the natives. About 600 B.C. a body of Phœnicians founded the most celebrated of the Greek colonies in all Gaul, to which they gave the name of Massilia, now Marseilles. When Rome grew in power the Greeks of Massilia, animated by jealousy and fear of Carthage, became the allies of the Romans, and it was in aid of these allies, against whom the neighbouring tribes of Gaul had risen, that the first Roman expedition was sent into Gaul beyond the Alps (Gallia Transalpina). This was in 154 B.C., when the Romans, after subduing the insurrectionary tribes, handed over their territory to the Massilians. When the Romans were again called in to aid their Greek allies in Gaul (125 B.C.) the territory which they subjugated was retained by them, and erected into a Roman province. The first Roman settlement was Aquæ Sextiæ (now Aix), which was founded in 122 B.C., and their power was to some extent secured by the foundation, in a favourable situation, of the colony of Narbo Marcina (Narbonne), B.C. 118. This Roman territory in the south-east of Gaul was long known simply as Provincia, whence the modern Provence. Not long after coming into the possession of the Romans this province was in danger of being wrested from them by vast hordes who came from the eastern side of the Rhine and inundated Gaul. Ancient writers give the names of Cimbrî and Teutones to these invaders, but there is so little else known concerning them that it cannot even be determined whether they were one or two peoples. Having reached the banks of the Rhône they routed five Roman armies in succession, and had they then crossed the Alps might have imperilled the safety of Rome itself. Fortunately, however, they turned their course to the Pyrenees, and before they returned Marius was ready with another army to defend the Roman province. A battle took place at Aix in B.C. 102, in which the barbarian hordes were totally defeated, and another detachment who had made their way into northern Italy met with the same fate in the year following. From that year till B.C. 58, when Cæsar obtained the Roman province in Gaul as his proconsular province, there was comparatively little change in Gaul; but no sooner did Cæsar appear than one pretext after another was found for gradually subduing the whole of Gaul. The conquest was completed between the years 58 and 51 B.C. (Cæsar's authority in Gaul having previously been renewed for another term of five years). Under Augustus the whole territory was divided into four provinces: Gallia Narbonensis, the former Provincia, now called

Narbonensis from the town of Narbo; Aquitania, now extended to the *Liger* (Loire); Gallia Lugdunensis, from Lugdunum (Lyons), a colony at that time newly planted; and Gallia Belgica, including the modern Belgium, as well as all that part of what is now called France which lay to the north of the Seine and the Marne (Seguana and Matrona). The whole country was then divided into sixty municipal districts, each of which was administered by a Roman colonial city, or *municipium*. The chief seat of the government of the whole of Gaul was the colony of Lugdunum. This administrative division of Gaul under the Romans subsisted till the fourth century, when a new division was made of this portion of the empire into seventeen provinces and 120 municipal districts; and the city of Lugdunum was now overshadowed by a newer colony (Trèves), planted on the banks of the Moselle in the midst of the Treviri. In A.D. 365 another important change was made in the administration of Gaul by the institution, by Valentinian I., in all the municipia, of tribunes, a class of officers who were designed to guard the interests of the municipia against any encroachments on the part of the imperial officers. As this office was nearly always assigned to the bishop of the place (Christianity having long been established in Gaul), the growth of the episcopal authority in the cities may be held to date from this period. Before this change in the administration of Gaul was made, the beginnings of still greater changes had begun to make themselves manifest. The Roman Empire was in its decline, and the constant revolutions and civil wars in the heart of the empire emboldened some of the Gaulish peoples to make attempts to recover their independence. The Romans thus found it difficult at times to maintain their power in Gaul, and the degree of the authority possessed by the empire depended chiefly upon the personal gifts of whoever happened to be at its head. The weakness of the empire was also felt by the German tribes bordering on Gaul, who did not find it difficult to establish themselves in Roman territory, when, owing to the dangers to which the empire was exposed in Italy and elsewhere, the legions stationed in Gaul had to be withdrawn, or to be reduced so much in strength as to be easily overmatched by the German invaders. The Gaulish tribes having lost their warlike habits and disposition during the Roman occupation, were no longer able to offer any resistance, so that, once the Roman legions were overcome, the German tribes found no obstacle to their settlement. It was during the fourth century, a period of growing misery in Gaul, that these settlements began to be made, and the most important of the settlers were the members of one of two confederacies of German tribes which had formed themselves on the right bank of the Rhine in the first half of the third century—one confederacy consisting of northern tribes (Sigambri, Salii, Chamavi, Marsi, Bructeri, Cherusci, Catti, &c.), who assumed the name of Franks, that is, 'the brave,' and the other of southern Suevoian tribes, who called themselves the Alemanni, or 'men.' The former are first mentioned by a Latin writer, under their title of the Franks, as having been conquered by Aurelian (afterwards emperor) in 241, and it was they who set the example to the other German tribes by crossing the Rhine and occupying part of the territory as far as the Somme on its left bank. Here they were allowed to remain without interference on the part of the Romans, who were even content to recognize them as allies, and a considerable time elapsed before they made any attempt to extend their conquests. Meantime, within about half a century after the events just recorded, that is, soon after the beginning of the fifth century, the great movement of the Ger-

man tribes which ultimately occupied Italy, France, Spain, and the Roman province of Africa, commenced. Hosts of Suevi, Alani, Vandals, and Burgundians overran France, where the Burgundians settled, founding a kingdom on the east in the basins of the Saône and the Rhône, while the others crossed the Pyrenees and traversed Spain, and the Vandals passed into Africa. These were soon afterwards followed by the Visigoths from the banks of the Danube, who, under their leader Alaric, founded a kingdom in the south-west of Gaul, extending from the Loire to the Pyrenees, and afterwards conquered, in addition, three-fourths of Spain. These invaders did not altogether drive out the previous Gallo-Roman occupants of the conquered land, but merely quartered themselves upon them, under the euphemistic title of 'guests,' assuming to themselves two-thirds of each estate, leaving the remainder to their 'hosts,' the original owners. There was still a portion of Gaul left under Roman rule, that, namely, to the north and west of the kingdoms of the Visigoths and Burgundians, and to the south of the territory occupied by the Franks. Scarcely had the country begun to settle down under the new arrangements when it was again invaded by hosts as numerous as the previous ones, and much more barbarous. These were the Huns, a nation of horsemen who had come from Central Asia, and who are described as hideous in appearance and savage in disposition. After destroying the Burgundian kingdom on the east side of the Rhine, having its capital at Worms (an event which forms the historical basis of part of the action of the *Nibelungenlied*), they penetrated, under their leader Attila (the Etzel of the *Nibelungenlied*) into Gaul, but were met by the Roman general Aetius, at the head of an army composed partly of Roman legions and partly of contingents from the Visigoths, Franks, &c., and, after prodigious carnage, were defeated (A.D. 451) in a battle fought on the Catalaunian Plains (generally said to be the plain round Châlons-sur-Marne), and compelled to leave the invaded territory. Among the most prominent allies of the Romans in that sanguinary battle were the Salian Franks, under their leader Merovæus. Thirty-five years later they were turned from allies to enemies, and attacked as they defeated the Romans, which was the first step in conquering the whole of Gaul and founding a new kingdom, France, which derived its name from the conquerors. Their leader at this time was Clovis, who is described by Gregory of Tours as a 'great prince and a redoubtable warrior.' He was the grandson of Merovæus, and succeeded his father Childeric in 481, five years after the overthrow of the Roman Empire in the West. To enable the reader to follow clearly the course of events that followed one another during the lifetime of this great conqueror it will be convenient to give here a statement of the political divisions of Gaul at the time when he was recognized as the king of the Salian Franks. In the south-west there was the Kingdom of the Visigoths (the capital of which was Toulouse), extending in Gaul from the Loire to the Pyrenees, and from the Bay of Biscay to the Rhône, and even over the territory on the east of the Rhone to the south of the Durance. Next there lay to the north of the kingdom of the Visigoths the Roman territory, which had been little affected by the fall of the Western Empire. It extended from the Loire to the Somme, and on the east side was bounded by the Vosges. The region lying between the Vosges and the Rhine was now occupied by the southern German confederacy, called the Alemanni, who had pushed the Burgundians further south, so that their kingdom was now limited to the valleys of the Saône and Rhône from the Vosges on the north to the river Durance on the

south. Both the Visigoths and the Burgundians had by this time adopted, to a considerable extent, the Roman civilisation, and had already received Christianity. Unfortunately, however, as it turned out for themselves, they had received it from Arian missionaries. In addition to these there was a Saxon colony which had planted itself about Bayeux, in Normandy, and another small colony of British settlers in the west of Bretagne, which was named from them Little Britain. The rest of Bretagne, and all the region between the mouths of the Loire and the Seine, are said by some writers to have been inhabited by independent native tribes; but this is doubted by others, and no mention of such a circumstance is made by Gregory of Tours. Finally, the portion corresponding mainly to the modern Belgium was occupied by the Franks, who were not all under one head, but recognized various leaders, the chief of whom had their capitals at Cambrai, Tournai, Cologne, and Tërouanne. It was these last then, the Franks, who were destined to bring unity out of this chaos. The Salian Franks, whose king it was, as has been already mentioned, that accomplished this, were by no means a powerful tribe. They occupied only a few districts of what is now Belgium, and could scarcely muster more than 5000 men capable of bearing arms. At the age of twenty Clovis proposed to his followers an expedition into the Roman territory, and induced the King of Cambrai to support him in his enterprise. The expedition was actually undertaken, and in the battle which ensued, near Soissons (486 A.D.), the Roman governor Syagrius was defeated, and compelled to take refuge among the Visigoths. He was afterwards delivered up to Clovis, and put to death. Clovis was now master of all the Roman territory in Gaul except the towns, the inhabitants of which, urged on by the bishops, refused to submit to the conqueror. But what he could not at once effect by force of arms was effected peacefully by his marriage with Clotilda, a Christian and a Catholic, the niece of Gundebald, king of Burgundy. The bishops, hoping that Clovis himself would soon be converted, immediately opened their gates to him. The adoption of the Christian faith by Clovis followed three years after. It is said that in the battle of Tolbiac (supposed to be Zülrich), fought in 496 against the Alemanni, who had invaded the territory to the west of the Voeges, in the hope of participating with the Franks in the spoil, Clovis, being hard pressed, vowed that he would adopt the faith of Clotilda if the battle were decided in his favour. At the end of the day the victory was his, and after the close of the war, when the Alemanni acknowledged the supremacy of the Franks, he was solemnly baptized by the Bishop of Rheims in the Athanasian or orthodox faith, and 8000 of his followers along with him.

Whatever may have been the motives which induced Clovis to take this step, it was undoubtedly the wisest thing that he could have done. It at once secured him the favour and support of all the Gallo-Roman bishops, not only in the formerly Roman territory, but also in that of the Burgundians and Visigoths. They were now as eager to see his power extended over the whole of Gaul, in order that the Arian heresy might be overthrown, as they had been obstinate in their resistance to him while he was still a heathen, and before he had married a Christian wife. This was what he was himself bent upon. As soon as he had established his power firmly in the north he turned his arms against the Burgundians, and rendered them tributary (500); and seven years afterwards, saying that 'he could not bear to see a part of Gaul possessed by these Arians,' who persecuted the bishops of the orthodox faith, he marched against them, and having subdued them, reduced nearly the whole of their

territory under his sway. They were saved from the complete loss of their territory to the north of the Pyrenees only by the assistance of the great Theodoric, king of the Ostrogoths (the Dietrich von Bern of the Nibelungenlied), who had, shortly before the end of the fifth century, founded a kingdom which stretched from the most southern point of Italy to the Danube. As it was, the only part of their possessions in France which the Visigoths were able to keep was Septimania, that is, the strip of maritime country between the Pyrenees and the mouths of the Rhône. The region lying to the south of the Durance and east of the Rhône was retained by the Ostrogoths.

The dominions of Clovis, with the tributary states, now comprehended the whole of Gaul with the exception of the districts just mentioned, and of Gascony and Brittany. Into the former no Frankish army had ever entered, and the latter still maintained its independence under native military chiefs. The Saxon colony mentioned as having been planted at Bayeux shared the fate of the Roman territory by which it was inclosed. Beyond the limits of Gaul they included all the territory that had belonged to the conquered Alemanni on the right bank of the Rhine, extending to the basin of the Neckar and the Main, which was now assigned to Frankish settlers, and took from them the name of Franconia. The Alemanni were compelled to move further south, to the district of Suabia, and here acknowledged a certain amount of allegiance to the Franks as long as they did not feel themselves powerful enough to behave as an entirely independent people. Having conquered this vast territory the object of Clovis was now to rid himself of all the other Frankish chiefs, and in accomplishing this object he showed himself to be possessed of other qualities less admirable than those ascribed to him by Gregory of Tours. He did not hesitate to resort to the basest treachery and the most barbarous cruelty, either allying with his own hands or causing to be slain all the other Frankish kings, his own relations, thus adding to his dominions all the territory on the north as far as the Rhine. He was now the sole Frankish king, the founder of the dynasty which reigned till 752, and which obtained the name of Merovingian, from his grandfather Meroveus. He died in 511, leaving his kingdom to be divided among his four sons.

This was a common practice among the kings both of this and the succeeding dynasty. The whole of the territories above mentioned, and more also, were sometimes united under one ruler, but more frequently they were distributed among different members of the reigning family. In all these divisions during the Merovingian period the chief power of the Franks was concentrated in the two districts called Neustria and Austrasia, the former of which comprised the western part of what before the conquests of Clovis was Roman territory, and the latter the eastern part of the same territory, along with the original territory of the Franks. A large part, perhaps the greater part, of the history of the Franks under the Merovingian kings is the history of the contests between these two states, and more especially of the plots laid, and the treachery and cruelty practised by the rulers of each to overthrow the power of the other; for in respect of the cruelty and treachery of their disposition, and their utter disregard of family ties, the most of the descendants of Clovis closely resembled their ancestor. As illustrative of the general character of these times it is enough here to make reference to the crimes and intrigues of Fredegunde of Neustria, and Brunehaut or Brunehilde of Austrasia, an account of whose careers will be found in the articles devoted to them. (See BRUNEHILDE and FREDEGUNDE.) It is needless at this place to go into

the details of this confused and bloody period. All that is necessary is to give a general account of the position which the Franks then occupied in Europe.

The spirit of conquest which was so powerful in Clovis still lived in his sons, and under them the Franks, though divided, succeeded in enlarging their empire still further. Thuringia was conquered (530), Burgundy reduced from a tributary to a subject state (584), and the Alemanni of Suabia fully incorporated in the Frankish Empire. Under Clotaire I., the last surviving son of Clovis, the dominions of the Franks, thus extended, were in 558 united under one ruler for the first time since the death of Clovis. Clotaire I. lived till 561, when the dominions of the Franks were again divided, and it was during this second division that the two princesses above mentioned flourished. The next unification took place under Clotaire II., who reigned as sole king from 613 till 622, when he appointed his son Dagobert king of Austrasia, under the guardianship of the mayor, Pépin of Landen, and Saint Arnoulf, bishop of Metz—a circumstance which is memorable on this account, that these two guardians of Dagobert were both ancestors of that line of mayors of the palace which, after usurping all the royal power, culminated in the Carolingian dynasty of kings. A son of Arnoulf married a daughter of Pépin, and the offspring of this union was Pépin d'Héristal, the first of the mayors referred to. On the death of Clotaire II. in 628, Dagobert succeeded him as sole king, and his reign saw, in the first place, the Frankish power raised to the greatest height which it reached under the Merovingians, but saw also the beginning of its decline. During the most prosperous part of his reign his dominions extended from the Weser to the Pyrenees, and from the Atlantic Ocean to the frontiers of Bohemia. He was the ally of the emperors of Constantinople; he interfered in the affairs of the Visigoths of Spain, and in those of the Lombards of Italy. In short, he might be regarded as the head of all the barbarian tribes which then occupied the provinces that had formerly constituted the Roman Empire in the west. But even during his lifetime the hold of the Franks on some of the more remote parts of their dominions began to be loosened, and after his death in 638 the states which broke away from their allegiance became more numerous. The kingdom was then once more divided, one of his two sons (both minors) receiving Neustria, under the guardianship of Erkinwald, and the other Austrasia, under that of Pépin of Landen.

It was at this period that the personal authority of the Merovingian kings began to sink into insignificance, and their power to be usurped by the mayors of the palace. This was more particularly the case in Austrasia, where the authority of the king was entirely set aside, while in Neustria there was still some lingering respect for the Merovingian race. In the former kingdom the great vassals or nobles entirely refused any allegiance to the king, and conferred on two of their number, Pépin d'Héristal and his cousin Martin the title of Dukes of the Franks (679). Ebroin, the successor of Erkinwald, had meanwhile crushed with vigour similar attempts that had been made in Neustria, and some of the Neustrian nobles having fled to Austrasia, Ebroin now demanded that they should be given up. This was refused, and war broke out between the two kingdoms. A battle was fought at Testry, near Pérance, in 687, in which *Roman France*, as Neustria had now come to be called, was vanquished by *Teutonic France*, and the authority of Pépin d'Héristal (Martin having been treacherously slain some years previously) rendered supreme throughout the kingdom. This date may be regarded as that of the real

termination of the Merovingian line, for although kings belonging to this family continued to be crowned till 752, they were mere puppets, 'rois fainéants' as they are generally called: the real power was in the hands of the mayors of the palace.

It was natural that during these internal commotions among the Franks the dependent states in France and Germany should have disowned their allegiance, and the first efforts of the new masters of Neustria and Austrasia were directed towards bringing them again into subjection, as well as towards reducing the power of the Frankish nobles, who no longer paid any respect to the royal authority or those who had assumed it. Pépin died in 714 without doing much to effect either object. He was succeeded, after a brief period of anarchy, by his son Charles Martel, or Charles the Hammer—a title he earned by the courage and strength he displayed in battle. During his tenure of power all Europe was threatened by the Saracens, who, after traversing the north of Africa, had crossed over into Spain and occupied it, then penetrated into France and seized Aquitaine, at that time ruled over by a member of the Merovingian race holding the title of duke. He appealed for assistance to Charles Martel, who met the Saracen hosts on a plain between Tours and Poitiers, where in 732 he totally defeated them in a battle which, on account of its carnage and the decisive nature of its results, calls to mind that fought against the Huns on the Catalaunian plains. The Saracens were at once driven from every part of France except Septimania, which they had taken from the Visigoths, who had continued to hold it ever since the overthrow of their kingdom by Clovis. Another consequence of this battle was that the Duke of Aquitaine took an oath of allegiance to Charles Martel. Pépin le Bref, the son of Charles Martel, was the first of his family who was recognized as King of the Franks. He succeeded his father in the possession of Neustria in 741, while Austrasia fell to his brother Carloman, who died in 747. Wishing to gain the favour of the Neustrians, who were still inclined to the Merovingian house, he at first proclaimed Childéric III. as king, although the throne had been for some time previously left vacant; but ultimately he referred to Pope Zacharias the claims of himself and of Childéric to the title of king, and the pope replied that he should bear the title who held the power. In 752 Pépin was crowned and anointed King of the Franks by Boniface, archbishop of Mayence. Childéric, the last of the Merovingians, was confined in a monastery. From this date the reign of Pépin was one of almost continuous war and conquest. In Italy he defeated the Lombards, and gave their territory to the popes; in France he wrested Septimania from the Saracens (752-759), and subjugated Aquitaine (759-768). In 768 he died, and was succeeded by his sons Charles, afterwards known as Charlemagne, and Carloman. The latter dying in 771, Charlemagne then became sole ruler, and by him was effected what his ancestors from Pépin d'Héristal had aimed at, the reduction of all the territories that had at any time been subject to the rule of the Franks. He effected even more than this, for he conquered and organized an empire which extended from the Atlantic on the west to the Elbe, the Saale, and the Bohemian mountains on the east, and embraced also three-fourths of Italy, and Spain as far as the Ebro. By Pope Leo III. on Christmas-day, in the year 800, he was crowned in the name of the Roman people as Emperor of the West. His power was respected by the emperors of Constantinople, and his fame extended so far that even Harun Al Raschid, the caliph of Bagdad, sent him valuable presents from the far East. He died in 814.

The glory of the Carolingian line of kings may be said to end with Charlemagne himself, although he was only the second of his family who bore the title of king, and although it is from him that the line is named. After his death, or at least after the death of his son Louis I. (le Débonnaire), in 840, the history of the Carolingians bears a close resemblance to that of the Merovingians, until in 987 it reaches a similar termination. The latter part of the reign of Louis was disturbed by the quarrels of his sons, whom he had now associated in the government with himself, but who were unable to agree as to the share of the empire which should fall to each. After the death of Louis they took up arms against each other, and it was not till after the hard-contested battle of Fontenailles in 841 that peace was brought about and the brothers agreed to the partition of the empire proposed in the Treaty of Verdun (843). According to this treaty Italy, Burgundy, and that part of Austrasia which hence took the name of *Lotharii regnum* (Lotharingen, Lothringen, Lorraine), fell, along with the imperial dignity, to Lothaire, France to Charles the Bald, and to Louis the territories on the right bank of the Rhine. From this time the tribes in the east began gradually to fuse together into one nation, and the separation between France and Germany became proportionally more and more distinct. They had not yet, however, been united for the last time under one rule. After Charles the Bald had been succeeded in 877 by Louis II. (le Bègue, that is the Stammerer), and Louis II. by Louis III. (879-882) and Carloman (879-884), the whole of the dominions of Charlemagne came under the sway of Charles the Fat, who remained sole ruler of the empire till 887, when he was deposed. From that date the political history of France is distinct from that of Germany.

The royal power in France was then usurped for a time by Eudes, count of Paris, but in 893 Charles III. (the Simple), the brother of Louis III. and Carloman, was recognized as king. His kingship, however, was merely nominal. Since the death of Charlemagne it gradually came to be an established custom that the son should succeed to the feudal possessions of the father, and in 877 the right of hereditary succession to fiefs was recognized by law. The result was that by the time of Charles the Simple France had in effect become covered with a multitude of petty kingdoms, the rulers of which bore the titles of dukes and counts. Thus the Duke of Gascony possessed nearly all the district to the south of the Garonne; the Counts of Toulouse, Auvergne, Périgord, Poitou, and Berry, the provinces between the Garonne and the Loire; and the regions to the north and east of the latter river belonged to the Count of Flanders, the Duke of Burgundy, the Duke of France, and the Counts of Flanders and Bretagne. The entire possessions of the king consisted of a few towns that he had not as yet been compelled to give away as fiefs. His reign is memorable for one great event, which is even more important in its bearings upon English history than on that of France. In the midst of these powerful nobles Charles found himself almost impotent, and was quite unable to offer any adequate resistance to the Norman pirates who had long ruled the seas and devastated the coasts of England, France, and other countries, and who now made more frequent and more destructive incursions into French territory. Charles, accordingly, adopted the wisest policy that he could have followed in the circumstances—surrendering to them in 912 the province which took from them the name of Normandy in order that they might settle there peacefully and cease to lay waste the country by their ravages. Towards the end of his reign Charles

found himself so weak as to be unable to resist his own nobles, who in 922 elected one of their number, Robert, duke of France, king, in opposition to him, and upon the death of Robert in 928 conferred the same dignity upon Raoul or Rudolph, duke of Burgundy. During this period Hugh of Paris, as he is generally called, duke of France, was really the most powerful person in the kingdom, and held King Charles in close captivity. Charles died in 929, but was not succeeded by any king of the Carolingian dynasty till the death of Raoul in 936, when there reigned in succession till 987 the son, grandson, and great-grandson of Charles—Louis IV. (D'Outremer), from 936-954; Lothaire, from 954-986; and Louis V., from 986-987. During these three reigns the real power, such as it was, was held by Hugh of Paris till his death in 956, and then by his son Hugh Capet. On the death of Louis V. without children in 987 Hugh Capet mounted the throne himself, and thus became the founder of the Capetian dynasty.

At the accession of the Capetian line of kings the first task which they had to perform was to reconquer their prerogatives from the great vassals. The fact that by the transference of the crown to Hugh Capet it was united to the great fiefs of Paris and Orleans was indeed in itself a great addition to the strength of the monarchy; but in spite of that the kings did not acquire any great power in France till the time of Philip Augustus at the end of the twelfth and the beginning of the thirteenth century. Hugh Capet died in 996, and his first three successors, Robert (died 1031), Henry I. (died 1060), and Philip I. (died 1106), who effected nothing whatever towards the establishment of the royal authority, deserve merely to be mentioned in this sketch. At the death of Philip I. the royal domain was considerably smaller than it had been under Hugh Capet, and the authority of the king was scarcely regarded even in the parts around his own immediate possessions. It may be worth while to remember, however, that though Philip himself was so inert and incompetent a monarch it was during his reign that one French subject conquered England, another Sicily and Southern Italy, and a third Portugal, each founding royal dynasties in the lands they conquered; and that the first of the great Crusades, mainly composed of Franks, set out to deliver Jerusalem from the infidels, and founded a Frankish kingdom in the Holy Land. When Philip I. died he was succeeded by Louis VI. Louis was a complete contrast to Philip, resolute in his endeavours to make his power felt throughout his kingdom, and active in the field, compelling his refractory nobles to yield submission. Two circumstances aided him in his efforts. The one was that many of his nobles had greatly weakened their power in order to equip themselves for the great Crusade, or had joined it and never returned; and the other was the growth of towns and communes, which ultimately became the allies of the kings in keeping a check on the nobles. Louis VI. granted eight charters to communes, that is, gave the royal sanction and guarantee to treaties of peace which towns that had grown up on the fiefs of vassals had been able to exact from their feudal superiors and by which they secured to themselves certain rights and privileges, and a certain measure of independence and self-government. These communes continued to grow in number and strength till the fourteenth century, when their charters were torn up, but not before they had nurtured a new class of society, which was able in some respects to fill their place.

Louis VI. died in 1137, and was succeeded by his son Louis VII., who reigned till 1180. Louis VII. was not, like his father, an active soldier, but

under the guidance of Suger (who had been confidential adviser likewise to Louis VI.) he followed the same policy. During his reign the stability of the French throne was endangered by the great influence acquired in France by Henry II. of England, who possessed either by inheritance or by marriage the whole of the west of France except Brittany, and obtained some influence even in that province by the marriage of one of his sons with the only daughter of the count. Fortunately for France, Henry, through domestic embarrassments, was unable to pursue any schemes of conquest which he might have cherished against his feudal superior in France. Louis was succeeded by his son Philip Augustus (Philip II.) In accordance with the custom of the Capets, Louis had taken care to have him crowned as his successor during his lifetime, and the *peers* of France, that is, the great nobles who held their fiefs directly of the crown (not including those who held their fiefs of the king as vassals of the Duke of France), were present at the ceremony, one of the first signs of the growing power of royalty. The vigour of Philip saved the throne of France from the danger with which it was threatened by the great ascendancy which the King of England had acquired among the vassals of the King of France. Having summoned the weak King John to appear before the court of peers to answer for his conduct in the case of Prince Arthur, he declared, when John refused to appear, his fiefs to be confiscated, and at once proceeded to execute the sentence by seizing Normandy, Maine, and Anjou. His son Louis VIII., who succeeded him in 1223, carried on the work by the conquest of Poitou, and was proceeding to that of Guienne when he was diverted from it by the hope of making a great acquisition in Languedoc. Here a religious war had sprung up against the Albigensians, who were defended by the Count of Toulouse, and the final result of the war was the extinction of the house of Toulouse and the strengthening of the crown by their domains passing to the royal family and ultimately to the crown itself. Louis VIII. had died in 1226, before the completion of the war, but not before a decidedly preponderating influence had been acquired for the crown. This influence was still further increased and the unity of France more firmly consolidated in a peaceful way by the wisdom and justice of Louis IX. (St. Louis), whose Establishments, belonging to the close of his reign, may be regarded as having put a formal seal upon this re-established unity, for these form the first legislative enactments of the house of Capet, the first instance of general legislation for the Kingdom of France for nearly 400 years, the last Capitulary or general law having been promulgated in the reign of Charles the Simple. (For the part which this monarch, as well as Philip Augustus and Louis VII., took in the Crusades, see CRUSADES.)

Louis IX. died in 1270, and from this date, under Philip (III.) the Bold (died 1285), Philip (IV.) the Fair (died 1314), Louis X. (died 1316), John I. (died 1316, after a reign of five days), Philip V. (died 1322), and Charles IV. (died 1328), the crown continued steadily to increase in power by the acquisition of fresh domains and other means until the outbreak of the wars with England. In the reign of Philip III. a blow was given to the declining power of the nobles by the institution of letters of nobility conferring the rank of nobles upon commoners. Still more important was the recognition by Philip IV. of the *bourgeoisie*, the new class of society that had grown up in the communes, by calling their representatives as deputies of the cities to form one of the three orders of the States General (*états généraux*), which were first convoked by this

monarch in 1302. The other two orders consisted of the clergy and the nobility. No small accession of strength to the crown was gained also by the suppression of the order of Knights Templars and the confiscation of their vast possessions, as also by the election of a French pope, who resided at Avignon under the influence of the French monarch.

The first branch of the Capetian line of kings became extinct on the death of Charles IV., the last of the sons of Philip the Fair, for what is called the Salic law (from the fact of its being the rule of succession to fiefs among the Salian Franks), which excluded women from the throne, had become the rule of succession in the case of the crown of France. The right of succession thus reverted to Philip of Valois, son of Robert of Valois, and grandson of Philip the Bold, who actually obtained the crown as Philip VI. His claim was disputed by Edward III. of England, who asserted his own right to the kingdom, on the ground that although the Salic law excluded women from the throne, it did not prevent a woman from transmitting the right of succession to her descendants, and that therefore he was the rightful heir as the son of Isabella, daughter of Philip the Fair. The claim thus set up by Edward led to wars between England and France, which were not terminated for more than 120 years. During this period France was reduced to a state of great misery. While Edward, victorious over Philip VI., and after his death in 1450 over John (II.) the Good, who was taken prisoner at Poitiers in 1456, compelled the surrender to England of some of the finest provinces of France by the Treaty of Brétigny in 1360, the country was plundered by banditti, and the Jacquerie, a mass of furious peasants (about 1358), satiated their spirit of vengeance in the blood of the nobility. Charles (V.) the Wise, who succeeded John the Good in 1364, and his constable, the brave Du Guesclin, were able to restore order only for a short time, although during this reign the English were driven out of most of their possessions in France. Then came the long and unhappy reign of the imbecile Charles VI. (1380-1422), disturbed by a rising of the peasantry and the *bourgeoisie*, which took place about the same time as that under Wat Tyler in England; by the struggles between the Duke of Orleans and the Duke of Burgundy (whose partisans were known respectively as the Armagnacs and Bourguignons) for the regency; and finally by foreign war, Henry V. of England having revived the claim of Edward III. to the French crown. The military successes of Henry led to the Treaty of Troyes (1420), by which he was to receive the hand of the daughter of Charles VI. in marriage, and the right of succession was settled on himself and his descendants, to the exclusion of the dauphin, afterwards King Charles VII. Charles VI. died in 1422, a few weeks after Henry V., whose son Henry VI., a minor, was acknowledged as king by the greater part of France. But between 1429 and 1431, amidst the licentiousness of war, of factions, and of manners, a peasant girl (see JOAN OF ARC) animated the French in the cause of the dauphin, who was crowned as Charles VII. at Rheims, July 17, 1429, and in 1451 the English had lost all their possessions in France, except Calais.

During the wars of that period the French kings had obtained the means of wielding an almost absolute power by the institution of a standing army. It consisted of two bodies, one being entirely cavalry, called ordinance companies, because they were created by the ordinance of Orleans in 1439; and the other infantry, created by another ordinance in 1448. From that time it was the policy of the kings to obtain an unlimited authority by destroying the liberties of the states, and at the same time to turn the

warlike spirit of the nation to foreign conquests. The despotic policy of Louis XI. (1461-83), whose maxim was *Dissimuler c'est regner*, effected this object by violence and cunning. In his reign some of the most important fiefs in France were united to the crown; Maine, Anjou, and Provence were left to Louis by the will of the last count; and a large part of the possessions of the Duke of Burgundy, including Picardy, Artois, the duchy of Burgundy proper, and Franche Comté, all came into his hands not long after the death of Charles the Bold, in 1477. His son and successor, Charles VIII. (1483-1498), united also Brittany to the crown by his marriage with Anne, the heiress of the fief; but he restored to Maximilian of Austria, who had married Mary, the daughter of Charles the Bold, Franche Comté, in 1493. He then undertook the conquest of Naples (1494), to which he made pretensions as heir of the house of Anjou. After a triumphant campaign in Upper and Middle Italy he took possession of Naples; but an alliance formed between Milan, Venice, and the Pope soon after compelled him to withdraw.

Charles was the last king of the direct line of Valois, which was succeeded by the collateral branch of Valois-Orléans (1498), in the person of Louis XII., who was descended from Louis of Valois, duke of Orléans, brother of Charles VI. In order to keep Brittany attached to the crown he married the widow of his predecessor. He was, on the whole, a just and beneficent ruler; but the ambition of conquest involved him in disadvantageous wars. As the grandson of a daughter of the house of Visconti he laid claim to the Duchy of Milan, which had been usurped by the Sforzas; and as the heir of Charles VIII. he maintained the pretensions of that monarch to Naples. Both of these claims he endeavoured to make good by arms, and in both cases was at first successful, in the case of the latter aided by Ferdinand of Arragon. Ultimately, however, he lost all his conquests. His ally in Naples, by his wily policy and his success in the field, managed to keep that territory to himself; and in the war with the league formed against him by Pope Julius II. he lost Milan and the supremacy of Genoa. It is this war that is celebrated for the exploits of Gaston de Foix.

On the death of Louis the crown reverted to another branch of the house of Valois, that of Angoulême, Francis I. (1515-47) being the grandson of John, count of Angoulême, uncle of Louis XII. Francis I. still continued the attempts at foreign conquest that had been made by his two predecessors, and in the great battle of Marignano, fought in 1515, he recovered Milan, with the supremacy over Genoa. But this duchy was now claimed by Charles V. of Germany, the life-long rival of Francis, as an imperial fief, and from these opposing claims there resulted five wars between France and Germany. In the first Francis was compelled to quit his hold of Milan and Genoa, and retreat across the Alps. In this retreat fell the valiant Bayard, 'the knight without fear and without reproach.' He soon after again invaded Italy, but was taken prisoner at the battle of Pavia (1525), and could regain his liberty only by agreeing to the Peace of Madrid (1526), in which he renounced Milan, and ceded the Duchy of Burgundy to Germany. By the Peace of Cambrai, however, concluding the second war, this duchy was restored to him (1529). The third war was concluded by the truce of Nice (1538), which left to each of the combatants whatever he happened to possess at the time. Finally, in the Peace of Crespy (1544), concluding the last war between France and Germany carried on in the lifetime of Francis and Charles, the former was allowed to retain both Burgundy and the Duchy

of Savoy and Piedmont, which he had seized in the third war. In his reign also Brittany was definitively united to the French crown. Henry II. (died 1559) pursued the same policy as his father Francis. War was renewed for the fifth time with the house of Hapsburg, then represented by Philip II. of Spain, the son of Charles V., as well as by the Emperor Ferdinand, brother of Charles. In the Peace of Cateau-Cambrésis (1559), by which the war was concluded, Savoy and Piedmont were surrendered by Henry, with the exception of a few towns which were ultimately given up by France. On the other hand, Henry remained in possession of the German bishoprics of Metz, Toul, and Verdun, which he had conquered with the aid of Maurice of Saxony. Thus was an end put to the open war between the monarchs, without, however, extinguishing the hereditary hostility between the kings of France and the house of Hapsburg. In the same reign Calais was recovered from the English (1558). Francis II., the husband of Mary Queen of Scots, succeeded his father Henry, but reigned little more than a year (1559-60). In the time of Francis I. religious persecutions opposed the progress of the reformation in France, and the persecutions were continued under his successors Henry and Francis. The foundation of the national debt, the weight of which broke down the throne 250 years later, was laid in this period. Intrigue and corruption gave to women a dangerous influence at court and in public affairs. Under the administration of Charles IX. (conducted during his minority by the queen-mother, Catharine de' Medici) France was inundated with the blood of Frenchmen, shed in the religious wars from 1562. (See BARTHOLOMEW'S DAY.) These continued throughout the reign of Charles IX. and his successor, Henry III. (1574-89), and were only terminated when Henry of Bourbon, king of Navarre, and since the death of Henry III. king of France, went over to the Catholic Church (1593), having hitherto been the leader of the Huguenots.

With Henry III. had expired the last branch of the house of Valois, and Henry IV. was the first French sovereign of the house of Bourbon, which inherited its right to the throne from Robert, count of Clermont, the sixth son of Louis IX. He united to the crown of France the Kingdom of Navarre, which he had inherited from his mother, Jeanne d'Albret. In his government of France Henry showed all the qualities of a great prince and a great statesman. After restoring peace to the country within and without, he granted religious toleration and full political privileges to the Calvinists by the edict of Nantes in 1598, and aided by the counsel of the wise Sully laboured diligently for the welfare of the state. While cherishing the great design of founding, with the aid of the Protestant union in Germany, and other European powers, a great Christian empire offering equal political privileges to Catholics, Lutherans, and Calvinists, and thus of humbling the house of Hapsburg, he was cut off prematurely by the dagger of the fanatic Ravallac (1610). During the minority of Louis XIII. the French policy was at first wavering, until the prime minister, Cardinal Richelieu, gave it a steady direction. He took advantage of the Thirty Years' War to humble Austria and Spain. He created that domestic despotism in France which rendered the government completely absolute, but finally occasioned the overthrow of the monarchy. The States General were assembled in 1614 for the last time till the Revolution. Louis XIII. died in 1643, the year after his great minister. The policy of Richelieu was carried on by Mazarin during the regency of Anne of Austria, while Louis was still a minor, and also for some years after Louis

was declared of age. Although enjoying the full confidence of the regent, Mazarin, as a foreigner, and, like Richelieu, the oppressor of nobles and commoners, was generally hated, which led to a rebellion and civil war (the wars of the Fronde—1648–53). Mazarin was compelled for a time to leave France, but soon returned more powerful than ever. In the first part of his ministry France obtained, by the Peace of Westphalia (1648), which concluded the Thirty Years' war, the German province of Alsace, and was confirmed in the possession of the bishoprics of Metz, Toul, and Verdun. The last work of Mazarin was the Peace of the Pyrenees (1659), by which France received from Spain additions both in the north and in the south, fourteen towns of Flanders, Hainaut and Luxembourg, along with the greater part of Artois on the north, and Roussillon on the south.

After the death of Mazarin, in 1661, Louis XIV. took the government into his own hands, and the period which follows is the most brilliant in French history. His ministers, especially Colbert, the great fosterer of French trade and manufacture, and generals such as Turenne, Condé, Luxembourg, and the military engineer Vauban, were alike the greatest of their time; and the writers of the period include the greatest names in French literature. Throughout his long reign Louis XIV. was chiefly bent on acquiring glory and increasing his empire by war. Accordingly he took advantage of the death of Philip. IV. of Spain to claim the Spanish Netherlands, in right of his wife, the daughter of that monarch; but was compelled to desist in his enterprise by the Triple Alliance between England, Holland, and Sweden. To punish Holland for its interference on this occasion his next war (1672–79) was waged primarily against that state, although Spain and the German Empire afterwards took part in it on the side of Holland. By the treaties of Nimeguen in 1678 and 1679, which concluded the war, France received Franche Comté and all the fortified places in the line of Valenciennes and Maubeuge from Spain, besides Freiburg in Breisgau from Germany. All these acquisitions were left untouched by the Peace of Ryswick in 1697, by which France was also maintained in the possession of Strasburg, a city which it had seized in 1681 from the Germans in the midst of peace. The last war of the reign of Louis XIV., the war of the Spanish Succession (1701–14), added little to the military glory of France, but Louis was nevertheless able to conclude it by sufficiently advantageous treaties (Utrecht, 1713; Rastadt and Baden, 1714). During this reign great injury was done to French industry by the revocation of the Edict of Nantes in 1685. Louis XIV. died in 1715, leaving a national debt amounting to no less than 4,500,000,000 livres.

Louis XV., the grandson of Louis XIV., succeeded at the age of five years. During his minority the regency was held by the able but licentious Duke of Orleans, who squandered in the most reckless manner the revenue of the state. It was during this period that the great Mississippi scheme was started by John Law, which created a perfect mania for speculation in France, but ultimately brought ruin on thousands of those who had a share in it, although many of the great had managed to enrich themselves by it. In 1723 Louis was declared of age. In the first part of his reign, during which he was chiefly guided by the wise minister Fleury, he was the favourite of the nation, and earned the title of the 'Well-beloved'; but when he sunk under the pernicious influence of the Marquise de Pompadour, the love of his people was gradually converted into hatred and contempt. The extrava-

gance of the luxurious and licentious court, in addition to the useless and costly wars in Germany (war of the Austrian Succession, 1740–48; Seven Years' War, 1756–63), exhausted the treasury and necessitated the increase of the taxes, which already pressed heavily on the bourgeoisie and the peasantry, all the more heavily because the nobility and the clergy were exempt from taxation, and because the taxes were not raised by the government itself, but by the farmers of the revenue and their extortionate officers. At this time it was the custom that every new tax should be registered at the parliament of Paris, the supreme court of justice, and from this circumstance the court concluded that, in absence of the states-general, which had not been convoked since 1614, the validity of any edict imposing a new tax depended upon its consent, and hence violent disputes arose between the parliament and the government at every new impost. Another source of constant strife between parliament and government was the *lettres de cachet*, a despotic encroachment upon personal liberty, inasmuch as any person might be apprehended under such a warrant and committed to prison without any reason being assigned. After a ten years' struggle Louis, wearied of the persistent opposition of this body, gave it a new constitution, and caused its most refractory members to be arrested. The final settlement of these disputes was thus postponed till the next reign. During this reign two important acquisitions were made by France. These were: Lorraine, joined to France in 1766, in accordance with the Treaties of Vienna of 1735 and 1738; and Corsica, bought from the Genoese in 1768, conquered in 1769.

With the reign of Louis XVI. begins the period of expiation for the crimes of the French monarchy and aristocracy, which had culminated in the preceding reign. The epoch is the more marked that the king himself was personally virtuous, and not only amiable in his private character, but patriotic in his designs, and even liberal in the conduct of his government. The fall of feudalism had left the nobility dependent on the court, but in France the people had no share in this victory. The monarchy had been powerful enough to suppress not only the independence of the nobles, but the representative institutions of the country. The fall of feudalism had thus resulted only in the destruction of those privileges of the nobles which interfered with the authority of the crown, and had left standing those which were merely oppressive to the people. Private jurisdictions, seigniorial and ecclesiastical, and local customs clogged the administration of the law, and the officers of justice appointed by the crown bought their appointments and sold justice to the people. Thus the royal prerogative had only created a new privileged class, the aristocracy of the robe, which, by the organisation of the parliaments, had become the only power except the king which had a voice in public affairs, and whose interests as often coincided with those of the other privileged classes as with those of the people. The nobility was rewarded for its subservience to the court by a multitude of oppressive privileges: which bore heavily on the industry of the country, while on the unprivileged classes fell the whole burden both of local and imperial taxation. Only half of the territory of France belonged to them, and it had to bear the whole burden of seigniorial and royal taxes, the tithes of the clergy, and the *corvées* or levies for the maintenance of the public roads. A line of 1200 leagues of internal customs and numerous special privileges hindered the development of trade and commerce. The wretched financial administration and extravagant expenditure of the court made the public taxes intolerably oppressive, at the same

time that they reduced the exchequer to bankruptcy. The farmers-general secured their shameful powers by bribery, in which even Louis XV. participated; and such was the discredit of the government that it could not borrow without security, and then only on the most usurious terms. It was easier for the English government to raise money at 4 per cent. on its own word than for the French to borrow at 20 per cent. on the security of the revenue. Among the desperate expedients employed to fill the exchequer was the creation and sale of offices, the holders of which were entitled to prey on the people. The offices of assayers of beer, controllers of perruques, hereditary cries of inquests, were among the fantastic privileges thus disposed of, while the holders of official appointments were so numerous that the clerks in the *greuier à sel* at Paris only exercised their functions one year in three. The organization of the army suffered equally with all other public interests. A cavalry regiment of 482 men had 142 officers, and the higher appointments could be held only by nobles. Hence the military power which France had exhibited in the reign of Louis XIV., and was again to exhibit in that of Napoleon, had prematurely declined. A French writer (Forbonnais) estimates the number of officers of justice and finance in 1666 at 47,780, and values their places at 420,000,000, or 1,000,000,000 francs at the present day. The higher clergy were exempt from taxation, but the lower were not exempt from beggary. An army of 15,000 monks subsisted on the charity of a people which, besides the tithes of the clergy, had already given a large part of its territory to the church. Thus the court, the nobility, and the clergy formed only one privileged class united to oppress the people. The time of reaction had now come, that of repentance and reformation for the privileged orders was already past.

Louis XVI., son of the dauphin and grandson of Louis XV., ascended the throne on the death of the latter, 10th May, 1774. With good intentions, he wanted firmness to carry them into execution, and especially to resist the intrigues of interested courtiers alarmed at the threatening aspect of the times, and was in every way unfitted to guide the state through the approaching crisis. The first difficulty of his government, and the rock on which it split, was the hopeless and unmanageable condition of the public finances. His first ministry contained two men of integrity and ability, Malesherbes and Turgot. The latter founded his financial reforms on extensive projects of political amendment—the abolition of *corvées* and *maitrises* (masterships, or exclusive privilege of conducting particular trades), on territorial taxation, the free circulation of grain, and other measures—all conceived in just anticipation of the demands of the people, but amounting to an actual revolution, and undertaken without due calculation of the resistance of the privileged classes. Of these classes the parliament of Paris made itself the champion. The project of replacing the *corvée* by a territorial tax was only registered in a *lit de justice*. By a device often practised the prejudices of the people were excited against their real interests by misrepresenting the projects of the minister, particularly in regard to the circulation of grain. Maurepas, the head of the ministry, was averse to the reforms of Turgot; and the feeble king, who personally favoured them, yielded to the opposition. Turgot was dismissed (12th May, 1776) and his reforming measures rescinded. In October, 1776, another man of note was called to the administration of the finances. Necker, a Swiss banker, who had already assisted the government with advances, was an able financier and a sentimental Liberal, but had neither the broad

views of Turgot, nor the tact and insight of a statesman. His hazardous tampering with reforms which he could not control largely contributed to bring on the revolution. Necker introduced many administrative reforms, which, though ineffectual to cover the gulf in the finances, excited the opposition of those interested in abuses. The occasion of his fall was significant. In 1781 he published a *compte rendu* of the finances, which, though very incomplete, was an appeal to public opinion, an innovation which alarmed and shocked all the upholders of the established order. His resignation was offered and accepted 21st May, 1781. During his administration war broke out with England, in consequence of the support afforded by France to the revolted American colonies of Great Britain—a war of fatal omen to the French monarchy, into which the vacillating king was dragged by the force of public opinion, the power and direction of which were thus early indicated. A treaty of commerce and alliance with the United States was signed 6th February, 1778, and was followed by an immediate declaration of war by England. The war was successful in its immediate object, and was terminated by the Treaty of Versailles, 3d September, 1783. Three years afterwards a commercial treaty was concluded with England.

A fatal result of the weakness of the king was that the queen, who was naturally of a firmer temper, began to take an interest in the government. Her influence, not being legitimate, necessarily took the form of intrigue, and made her the centre of the reactionary tendencies of the court and the privileged orders; thus exciting the jealousy and suspicion of the lower orders, and arousing against her a hatred without bounds, and which, in spite of her private virtues, could not be satiated until both her husband's blood and her own had stained the fall of the monarchy. By her influence Calonne became controller-general of the finances from 1783 to 1787. His first plan was to maintain the public credit by a brilliant and extravagant expenditure, and meet the wants of the treasury by borrowing. When this failed he resorted to the reforms of Turgot and Necker. A meeting of the Notables was called for 12th February, 1787. Calonne unfolded to them his plans, which were rejected. He was dismissed and banished to his estates. The opposition to reform had again triumphed; but in the assembly of the Notables a demand had been made for the convocation of the States General. Brienne, archbishop of Toulouse, one of the most active opponents of Calonne, was appointed to succeed him. The Notables were dismissed, and territorial taxation imposed in a *lit de justice*. The parliament, which resisted, was banished. The utter destitution of the finances, however, put a speedy end to the ministry of Brienne, and Necker was recalled 24th August, 1788. All ordinary measures were now unavailing, and Necker demanded the convocation of the States General. This body was convoked for 1st May, 1789, but even in the manner of convoking it a disastrous error was committed. The three estates had on former occasions met separately and voted by orders. Necker, with the Liberals, was desirous of giving more power to the tiers état, which had become in fact the most powerful order in the state. He proposed to double the numbers of the tiers, and to substitute an individual vote for the established method of taking the vote by orders. These changes were submitted to an assembly of Notables, which refused to sanction them. Necker then established the double representation by an order of the council, leaving the question of voting undetermined. An imperfect power was thus given to the tiers état, which carried with it an irresistible suggestion of its

completion by a usurpation of authority, and that body was, almost independently of its own will, driven on the course of revolution. The States met on 5th May. The *cahiers*, or powers and instructions of all the orders to their representatives, were full of demands for fundamental reforms. The first business which demanded the attention of the States was the authentication of the powers of the members; the mode of procedure in which would determine the order of meeting and voting. The tiers état demanded that this should be done in common; the other orders wished to proceed to the verification apart. After a brief struggle, during which an oath, called the *serment de la jeu de paume* (20th June), was taken by the deputies of the tiers, who had assumed the title of the National Constituent Assembly, not to separate till they had given a constitution to France, the clergy and then the nobles yielded, and the fusion of the three orders was effected on 27th June. The fusion had been effected against the will of the king; but when the crisis came he had as usual yielded to pressure, and then suffered himself to be led by the reactionary intrigues of his court. Necker was dismissed on the 11th of July, and recalled on the 27th. Foreign troops were brought to Paris to overawe the assembly. The people demanded arms, which the municipality of Paris supplied; and on 14th July the Bastille was captured and destroyed. The garde bourgeoise, formed by the municipality, was now transformed into the national guard. The command was given to Lafayette, who formed its colours by placing between blue and red the colours of Paris, white, the emblem of the French monarchy. Thus was originated the flag of the republic. The spirit of insurrection in the meantime had, since the beginning of 1789, been spreading in the provinces, and the urgency of affairs induced the assembly, on the 4th of August, to take a decisive step. On the basis of a future compensation all privileges were abolished. A banquet given to the foreign troops at Versailles at a time when the populace was threatened with famine, excited another insurrection. Versailles was attacked by the mob, and the king brought a prisoner to Paris (6th and 8th October, 1789). On this occasion, as on the taking of the Bastille, the ferocity and bloodthirstiness of the more lawless portion of the mob began to be fearfully manifested. This popular outbreak occasioned also the beginning of the emigration, so fruitful in future disasters to France. The king's brother, the Comte d'Artois, and others of his more extreme councillors, fled, and by transferring their intrigues to foreign courts, hastened the revolution, and prepared the way for the devastating wars by which it was followed.

In December, 1790, the king began to correspond secretly with foreign powers, and a secret convention had been made with Austria, Prussia, Piedmont, Spain, and Switzerland, to advance their troops to the frontiers with a view to a simultaneous occupation of the territory. To give effect to this plan it was necessary that the king should be free. In concert with the Marquis de Bouillé, who commanded the troops in the north of France, Louis made his escape from Paris (20th June, 1791), and endeavoured to reach Montmédy; but he was recognised on the road, arrested at Varennes, and brought back to Paris escorted by the commissaries of the assembly. A demonstration in the Champ de Mars, in favour of his deposition (17th July), was put down by force by La Fayette and Bailly, under order of the assembly. The popularity of that body, already declining, was seriously compromised by this step, but its labours were now drawing to a close.

On the 30th September, 1791, it brought its work

to a finish, after having redeemed its oath of 20th June. The constitution was sworn to by the king on 14th September, after which he was reinstated in his functions. Its political provisions were a single legislative assembly elected biennially; the executive power with a four years' veto, except in finance, to the king; the primary electoral colleges to consist of all citizens of twenty-five years of age and upwards, paying in direct taxes the equivalent of three days' labour annually. This limitation of the franchise was already looked upon as reactionary. The constitution embraced all those civil reforms which, afterwards incorporated in the code Napoleon, survived the political changes of the revolution. It deprived the king of arbitrary powers, and voted him a civil list; it provided liberty of worship, freedom of the press, of commerce, of industry; the laws of primogeniture and entail were abolished, and equal division of property among children made compulsory; confiscation of property for offences was abolished, and personal punishment substituted; titles were abolished; the clergy were reduced to public functionaries, salaried by the state; the territory of France was declared free through all its extent, and a re-division of it was effected (15th Jan. 1790) into eighty-three departments, nearly equal in extent; each department was divided into districts, each district into cantons, each canton into communes and municipalities. The number of the last was 44,828. This division afterwards proved an admirable instrument of centralization, and in repeated emergencies enabled Napoleon at once to lay his hand with ease upon all the military resources of France. With some excesses these measures swept away at one stroke all the real grievances which supplied the motive force of the revolution, and could they have been peaceably maintained it might have ended here. But they were the result of a sudden flood of enthusiasm which took no account of opposition, and which had only dispossessed and not destroyed the rival interests. One of the measures already mentioned in particular demands further details, as it was the means of meeting the financial difficulty, and at the same time of arming the enemies of the revolution, at whose expense it was effected. On 2d December, 1789, the domains of the church were, in the euphemism of the assembly, put at the disposition of the nation. The minister was authorized to sell these estates to the extent of 400,000,000 livres. Until the sale was effected he was authorized on the security of these national domains to issue a paper money having a forced circulation and a preference in the purchase of them. In 1792 the estates of the emigrants were confiscated in like manner. Thus was created that seemingly inexhaustible treasury of assignats which brought France so speedily into a financial anarchy worse than any she had yet experienced. Among the further reforms of the church were the reduction of monasteries to one for each municipality, and of bishoprics to one for each department. The bishoprics and curacies were made elective, and all the clergy were required to take an oath of obedience to this civil constitution. This oath was forbidden by the pope, and divided the clergy into *assermentés* and *non-assermentés* (sworn and unsworn); the latter, proscribed and persecuted by the state and followed by all devout Catholics, excited opposition everywhere against the revolution. Among other reforms was the reorganization of the administration of justice. The parliaments were dissolved by indefinite prorogation, the judicial functions were separated from the administrative, district courts were created and judges appointed for ten years, while the uniformity of justice was provided for by the erection of

a *cour de cassation* and a *haute cour de justice*. The formation of a code of civil laws was decreed but not yet effected. The assembly closed with an attempt to recall the émigrés, and it prohibited the re-election of its members. Mirabeau, the greatest orator of the assembly, and one of the boldest leaders of the revolution, had died prematurely, 2d April, 1791, from the excesses of his life.

Two distinguishing features of the revolution, the clubs and an incendiary press, sprung up during the period of this assembly. The clubs, of which the suggestion was borrowed from England, were a result of the rapid fermentation of new ideas. Among the most distinguished of them were the club Breton, which took the name of Jacobin from the convent where it met; its leaders were Lameth, Dupont, Barnave, and Robespierre; the club of the Cordeliers, also named from a convent, formed by Danton in 1790; the club of '89, consisting of the moderate reformers, Siéyès, La Fayette, &c.; the Feuillants, founded in 1791 by the royalists, and closed the same year.

The constituent assembly was, according to the constitution, immediately followed by the legislative assembly, which began its sittings on 1st October, but before the period assigned by the constitution it gave place to the convention. In the legislative assembly there were two parties of political importance, the Girondists, who led it, and the Montagnards, who subsequently became all-powerful in the convention. The royalists were already powerless. The Girondists Brissot, Pétion, Vergniaud, &c., were in theory republicans, but they kept terms with the monarchy, and endeavoured to proceed with moderation to the realization of their projects. The assembly was compelled at once to take a decisive course. By the declaration of Pillnitz the Emperor of Germany and the King of Prussia threatened an armed intervention to restore Louis to his rights. The assembly replied by passing severe measures against the émigrés and the *prêtres non-assermentés*, and by threatening the foreign powers with revolution instead of arms. The king was compelled in March to accept a Girondist ministry, and on 20th April, 1792, war was declared against the empire. The first attempts to assume the offensive were unsuccessful. The king maintained a treasonous correspondence with the allies, and refused to sanction the decrees of the assembly. On the 20th June, the anniversary of the Jeu de Paume, the people invaded the assembly and the Tuileries, and summoned the king to sign the decrees. He refused, but satisfied them for the moment by allowing himself to be crowned with a red bonnet. On the 26th July the Duke of Brunswick issued his celebrated manifesto, threatening, if the king was insulted, to deliver Paris to a military execution. The sections of Paris retorted by signing a petition demanding the deposition of the king before the close of the day (9th August). At midnight the tocsin sounded. The Tuileries, after a sanguinary combat, were taken and sacked. The king took refuge with his family in the assembly, which was invaded and compelled to submit to the dictation of the victors by assenting to the suspension of the king and the convocation of a national convention. The convention was an extraordinary assembly, summoned for an emergency, and thus recognized the fact that France was again without a constitution. The elections were, as a matter of urgency, conducted in the manner prescribed by the constitution, namely, by two stages, but all citizens were admitted to vote in the primary assemblies. Among the members elected 77 had sat in the constituent assembly, 181 in the legislative, and 491 were new. Nearly all were anti-monarchical. On 21st Sep-

tember the convention notified its existence to the legislative assembly, which at once resigned to it its functions.

The war now assumed a more favourable aspect. The victory of Valmy, 30th September, freed France of its invaders; that of Jemappes, 6th November, led to the occupation of Belgium.

During the first period of the convention the Girondists still held the lead. The first act of the new assembly was to proclaim the republic. On 8d December the king was cited to appear before it. On 20th January, 1793, he was, by four successive votes, sentenced to death within twenty-four hours, and on the 21st the sentence was executed. This violent inauguration of the republic shocked public opinion throughout Europe, and armed the neutral states against France. England, Holland, Spain, and the empire joined the coalition. A levy of 300,000 men was ordered. It was necessary to send some of these new levies to suppress the Chouan insurrection in Maine, Anjou, and Brittany. Nearly all the officers of rank had emigrated, and Dumourier, after being defeated at Neerwinden (18th March), had declared against the convention. The army lost confidence in its heads and became disorganized. Mutual suspicion and distrust reigned in the convention itself. The convention took measures suited to the gloomy aspect of affairs. A revolutionary tribunal was appointed to try offences against the state, a committee of public safety, with sovereign authority, was appointed (6th April), and the convention renounced the inviolability of its members. The period thus inaugurated is known in history as the Reign of Terror. The struggle between the Girondists and the Montagnards became violent. The latter, defeated in the convention, armed the sections of Paris. The convention, under pressure, ordered the arrest of thirty-one Girondists (2d June). Some of them escaped and excited insurrection in the provinces. A new constitution was adopted by the convention on 23d June, called the Constitution of the Year 1, the Republican Calendar being adopted on 5th October, 1793. In the meantime the majority of the southern towns declared against the convention, the French territory was invaded both on the north and south, and to all these dangers was added famine. The convention fixed a maximum price for the sale of provisions. A decree was passed excluding English manufactures from France. A levy was ordered of 1,200,000 men, and Carnot organized fourteen armies. The revolted provinces were speedily reduced. Bonaparte took Toulon from the English; and Jourdan, as commander-in-chief of the army of the north, was put in a position to oppose the principal forces of the coalition. The energy of the dominant party had risen to the danger, but it was accompanied by a ferocity without example. The revolutionary tribunal had already filled the prisons with victims. On the 17th September a law was passed against suspected persons, which practically proscribed whole classes, and included any one the emissaries of power chose to suspect within its sweep. On 10th October the constitution was suspended and the government declared revolutionary, a term which included unlimited power. Both in Paris and the provinces executions and massacres followed each other daily, and as new parties succeeded each other in the convention the leaders of the defeated parties were added to the usual list of suspected royalists or reactionaries. Thousands of paid committees were formed throughout France. Nantes, Lyons, Toulon, Arras, and others were delivered over to such agents as Carrier, Collot d'Herbois, Couthon, Fouché, Barras, and Lebon, who exhausted their ingenuity in inventing means of wholesale massacre. The queen was

executed on 16th October, the Girondists on 31st October, the Hébertists on 24th March, 1794, the Dantonists on 5th April. Robespierre had a new law passed on the 22d Prairial (10th June) to facilitate these executions, and from this date to 27th July 1400 persons are supposed to have perished. At length the reign of terror came to an end by the execution of Robespierre and his associates on 27th and 28th July.

The campaigns of 1793 and 1794 resulted favourably to the French arms. The Vendean insurrection was reduced from an open to a secret warfare. The allies made war on the old system of position and detail, and permitted the French, by a better concentration of their forces, to gain some decided advantages. Jourdan defeated the Prince of Coburg at Wattignies 15th and 16th October. Hoche wintered in the Palatinat. In Italy and Spain the French had also been able to carry the war beyond their own frontiers. In 1794 Pichegru, by the victory of Fleurus, recovered Belgium, and by the beginning of 1795 had completed the conquest of Holland, which, under French influence, constituted itself into the Batavian Republic. By the successes of Jourdan the allies were driven across the Rhine, and Spain was invaded. These successes induced Prussia and Spain to lay down their arms. By the treaties of Basel, signed by the former on 5th April, by the latter on 12th July (ratified 22d), 1795, these countries acknowledged the French Republic. The English had been successful at sea, and had made extensive captures among the French colonies.

In 1795 the convention gave the republic a new constitution, a chamber of *Five Hundred* to propose the laws, a chamber of *Ancients* to approve them, an executive of five members, one elected annually, called the *Directory*. This tame bequest of that once terrible assembly marked the progress of a strong reaction. The royalists conceived sanguine hopes of a restoration. Pichegru was gained, a royalist insurrection organized, and 30,000 men marched on the Tuileries, where the convention sat. Barras intrusted the defence to Napoleon, who, with 5000 men and his artillery, repulsed the insurgents. This event is called the affair of the 13th Vendémiaire (5th October, 1795). Bonaparte was now appointed under Barras to the command of the army of the interior. The convention was dissolved on 26th October. It had prepared a uniform code and organized a system of national instruction, and as the price of its military successes it had destroyed the national credit by the issue of forty-four milliards of assignats. On 1st March, 1796, a louis d'or was worth 7200 francs in assignats, and the armies, after all their successes, were in a state of absolute destitution.

In these circumstances opened the campaign of 1796—97, organized by Carnot. Jourdan and Moreau, each with 70,000 to 80,000 men, were to enter Germany to reach the basin of the Danube, the first by the valley of the Main, the second by that of the Neckar, and to descend upon the hereditary states of Austria; while Napoleon, with 40,000 men, menaced Italy. One object of the campaign was to make the armies live on foreign territories. Bonaparte's lieutenants in Italy were already experienced generals, Masséna, Angereau, Serrurier, Laharpe, Berthier. He assembled them and unfolded his plans, which silenced the jealousy naturally caused by his appointment. On leaving the council Masséna said to Angereau, 'We have found our master.' To the soldiers he issued the first of his rousing proclamations: 'You are ill-fed,' he said, 'and almost naked; the government owes you much, and can give you nothing. I am about to lead you to the most fertile plains in the world, and to opulent cities where you will find honour,

glory, and riches.' During four years the army had been struggling against the Sardinian and Austrian troops, without decisive success, on the southern slopes of the Alps and Apennines. The Sardinians stretched from the Bormida to the Stura, with an intrenched camp at Ceva. The Austrians were cantoned in the neighbourhood of Alessandria and Tortona, commanding the roads to Genoa and Milan. Napoleon threatened an attack on Genoa by Voltri, but made his real advance through the valley of the Bormida. By seizing Montenotte he placed himself in their centre; and having first repulsed the Austrians, drove the Sardinians before him to Cherasco, where an armistice was concluded (April 28), which was converted, on 15th May, into a definite treaty, by which Sardinia renounced the coalition and ceded Savoy and Nice to France. Bonaparte now turned upon the Austrians, and by forced marches to Piacenza compelled Beaulieu to retreat towards the Tyrol. He crossed the Po at Piacenza, stormed the Bridge of Lodi, which was held by the Austrians to cover their retreat, and entered Milan on 14th May. Brescia was entered on the 28th, the passage of the Mincio forced at Borghetto on the 30th; and the Austrians, after garrisoning Mantua, retired into the Tyrol. Napoleon followed up his successes by negotiations with the Italian princes and the pope, upon whom he levied contributions. The King of Naples signed an armistice on 5th June. Besides money, so much wanted by the directory, Napoleon provided a pleasing tribute to French vanity by stipulating for the surrender of pictures, manuscripts, and works of art. On Lombardy he levied a contribution of 20,000,000 francs; the pope promised 21,000,000. He sent 10,000,000 to the directory, which had not been able to defray the expenses of his campaign. While he besieged Mantua, a fresh army of Austrians under Wurmser advanced against him in three divisions. He raised the siege, beat one division under Quosdovich at Salo and Lonato (3d August), and another under Wurmser at Castiglione, on the 5th. Wurmser, reinforced to 50,000 men, again attempted to relieve Mantua. Napoleon, who had entered the Tyrol and had reached Trent after defeating 25,000 Austrians under Davidowich at Roveredo, descended the valley of the Brenta after Wurmser, defeated him at Bassano (September 8), and shut him into Mantua. In the meantime the Archduke Charles had defeated Jourdan and forced Moreau to retreat by the Black Forest to Alsace, which he reached in October. This enabled the Austrians to send a fresh army after Napoleon, consisting of 50,000 men, under Alvinczy and Davidowich. After sustaining a repulse at Caldiero, Napoleon outmanoeuvred Alvinczy and defeated him at Arcole, 15th—17th November. In January, 1797, Alvinczy, with large reinforcements, again advanced from Roveredo to the relief of Mantua. Napoleon defeated him on the 14th, at Rivoli. On 2d February he received the surrender of Mantua. Bonaparte now put an end to his armistice with the pope, and invaded the States of the Church. A speedy understanding was come to by the Treaty of Tolentino (19th February); the pope surrendered Avignon, Bologna, Ferrara, and the Romagna to France; these were added to the provinces of Modena and Reggio, taken from the duke, and formed the Cispadane Republic, as, after the battle of Lodi, Lombardy had been proclaimed as the Transpadane Republic. The Austrians were preparing for another invasion of Italy under the Archduke Charles, and Napoleon resolved to anticipate them before they should receive their reinforcements from the armies on the Rhine. He entered the Tyrol, driving the archduke before him, and had reached Judenburg, a few days' march from Vienna, when an armistice was accepted (7th

April) and preliminaries were signed on the 18th, at Leoben, ceding the Austrian Netherlands and Lombardy to France, and indemnifying Austria with Venetia. These preliminaries were confirmed by the Treaty of Campo Formio, signed 17th October.

In the meantime the internal condition of affairs was becoming worse. The assignats had been replaced by mandates on the public territories, which had fallen into the same discredit. The reign of terror had been followed by an excessive dissolution of manners. Brigandage prevailed in the provinces. Barras, a member of the directory, and other high officials, had been guilty of malversation and private jobbing in the public funds. The returned royalists were intriguing for a counter-revolution. The reactionary party had triumphed in the elections of May, 1797, and had succeeded in electing Pichegru president of Five Hundred, and Barbé Marbois, another royalist, president of the Ancients, and had replaced Letourneux in the directory by Barthélemy. The majority of the directory, relying on the support of Bonaparte, resolved to anticipate them. On the night of 4th September, 1797 (18th Fructidor, year 5), Augereau introduced 12,000 men into Paris, surrounded the halls of the councils and arrested the leaders of the reactionary party. The minorities of the two councils, assembled on the invitation of the directors, declared themselves *en permanence*, condemned fifty-three deputies, including the two presidents and the two members Carnot and Barthélemy, forming the minority of the directorate, to transportation; annulled the elections in forty-eight departments; and repealed the laws which had been passed in favour of priests and emigrants; and other violent measures were also taken. Moreau, who had betrayed the intrigues of Pichegru, was himself suspected, and deprived of his command.

Napoleon, who was named General of the Army of England, persuaded the directory to abandon the project of a descent on England, and proposed, as a means of ruining her Indian Empire, the conquest of Egypt. The army appointed for this expedition, consisting of 36,000 men, veterans of Arcule and Rivoli, embarked at Toulon 10th May, 1798, in a fleet commanded by Bruey. A body of artistic and scientific explorers accompanied it. In passing, they took Malta from the knights. While Napoleon was occupied with the conquest of Egypt, Nelson, who had pursued the French fleet, found it moored in the Bay of Aboukir (1st August), defeated, and nearly destroyed it. The French were thus already imprisoned in their conquest, the political value of which was confiscated in advance. After the battle of the Pyramids (July 21) the subjugation of Egypt was easily effected, and early in the following year Bonaparte proceeded to the conquest of Syria. After traversing the desert, and capturing Gaza and Jaffa, where he massacred the garrison, he laid siege to St. John d'Acre, which was defended by a Turkish garrison, assisted by the English commodore, Sir Sydney Smith. After sixty days' siege he was compelled to relinquish the attempt to capture this place and return to Egypt. On 22d August, in consequence of advices from Europe, he abandoned the command of the army to Kléber, and embarking in a frigate landed at Fréjus 9th October.

A second coalition had by this time been formed against France, embracing England, Russia, Austria, and other German states, Naples, Portugal, and Turkey. To meet this danger the councils passed the law of the conscription (5th September, 1798), and ordered a levy of 300,000 men. Championnet conquered Naples, and gave it the name of the Parthenopean Republic, 23d January, 1799. Switzerland had also received a constitution which permitted its

military occupation by France; and Genoa and the surrounding territory had been formed, after Napoleon's campaign, into the Ligurian Republic. The Cispadane and Transpadane Republics had been formed into the Cisalpine Republic.

The campaign of 1799 was disastrous to the French. Jourdan, who had crossed the Black Forest, was defeated by the Archduke Charles at Stockach on 25th March, and forced to retire beyond the Rhine. Schérer, who was intrusted with the command of the army of Italy, was defeated at Magnano on 5th April. Moreau, who superseded him, sustained further reverses; and MacDonald, who came to his assistance with the army of Naples, was totally defeated in the battle of the Trebbia, 17th-19th June. Joubert, who succeeded Moreau, was defeated and killed at Novi 15th August. These reverses lost France the territories which had been formed into the Cisalpine Republic. On the other hand, the Anglo-Russian campaign in Holland had failed; and Masséna, after a brilliant campaign in Switzerland, defeated the Russians and Austrians at Zurich on 25th September, which induced the Emperor Paul I. to make peace.

Napoleon, on his return, found the government in great embarrassment. Its credit was wholly gone. It was obliged to fund the interest of its debts or pay it in worthless paper money, and was reduced to the necessity of levying forced loans at home, while its agents pillaged the dependent republics. It was ill-obeyed by its generals. Championnet and Brune imprisoned its representatives. A revolution had taken place in the government (18th June), but the new directors were as incompetent as the old. In these circumstances was accomplished the revolution of the 18th and 19th Brumaire (9th-10th Nov. 1799). The councils being alarmed with rumours of a Jacobin plot, the Ancients gave orders that both bodies of the legislature should be transferred to St. Cloud under the conduct of Bonaparte, who was intrusted with the command of the troops. Bonaparte had already secured the co-operation of Moreau and the other generals present in Paris. On the 10th Napoleon entered the council of the Ancients assembled at St. Cloud, and insisted on the necessity of a new constitution. On proceeding to the council of the Five Hundred he was received with cries of *à bas le dictateur*. General Leclerc, by his orders, entered and dispersed the assembly. The members of the two councils who were favourable to Bonaparte then appointed a provisional government of three consuls—Bonaparte, Siéyès, and Roger Ducos, and a committee consisting of twenty-five members of each council to draw up a new constitution.

The constitution was proclaimed on 15th December. The three consuls were appointed for ten years, and re-eligible. The first had all the executive powers, the others only a consultative voice. The laws, prepared by a *conseil d'état*, nominated by the consuls, were to be discussed by a tribunate of 100 members, and voted or rejected by a *corps législatif* of 300 deputies; three members of the *conseil d'état* were to defend the measures brought before the *corps législatif*, and three members of the tribunate were either to oppose or confirm them. The *corps législatif* could not debate. A senate composed of eighty members, not under forty years of age, and appointed for life, was to select from lists prepared by the electoral colleges the members of the tribunate and *corps législatif*. All Frenchmen of twenty-one years of age, domiciled for a year, and inscribed on the civic registers, were entitled to vote. The electors of each arrondissement chose a tenth of their number to form a list of communal notabilities, and from this list the

first consul chose the public functionaries of the arrondissement. The citizens on the communal list chose a tenth of their number for the departmental list, from which the functionaries for the department were chosen. The citizens on the departmental list chose a national list, from which the national public functionaries were chosen. This constitution was submitted to the approbation of the people, and accepted by 3,011,107 suffrages against 1567. The constitution was said to have been drawn up by the Abbé Siéyès. However this may be, nothing could have been better adapted for giving a despotic power to the head of the executive, who had, in the lists of Notables, perfect liberty of choice, while the electors were entertained with the charge of drawing up a classified series of local directories for his use. The departments were put under prefects directly responsible to the minister of the interior. The prefects, sub-prefects, and maires of communes had all their councils, which were merely consultative, the whole executive power being in the hands of the officer responsible to government. This centralization of the powers of government has survived all revolutions, which, by vesting all powers in the capital, it has done not a little to promote.

Bonaparte chose Cambacérès and Le Brun as second and third consuls. He revoked the conscriptions, and made efforts to conciliate both royalists and Jacobins. He wrote letters to the King of England and the emperor urging, in theatrical terms, the restoration of peace. Louis XVIII. wrote to Napoleon suggesting his own restoration. Napoleon was too much occupied to pay due attention at this time to the royal request, but he is said to have retaliated in 1804 by asking Louis to cede in his favour the rights of the house of Bourbon. The Chouan insurrection, which had again broken out, was suppressed. Credit revived with the restoration of order and the prospect of a strong government.

Napoleon's overtures of peace being refused, his next business was to prepare for war. He gave Moreau the command of the army of the Rhine, and determined himself to proceed to Italy. Masséna, with the remains of the French army, was shut up in Genoa. He crossed the Alps, and defeated the Austrians at Marengo on 14th June, 1800. By the Convention of Alessandria, signed on the 16th, Melas abandoned all Piedmont and Lombardy, to the Oglio. Napoleon then committed the command to Masséna and returned to Paris.

Moreau defeated the Austrians in several engagements during May, and forced them to take refuge in Ulm. The rest of the year was divided between campaigning and negotiating; but the latter having proved fruitless, Moreau again defeated the Austrians under the Archduke John, on 3d December, in the decisive battle of Hohenlinden. Brune, who succeeded Masséna, extended the Italian conquests in Tuscany and Venetia. Negotiations were then entered on by Austria, and the Peace of Lunéville concluded 9th February, 1801. The Rhine was recognised as the boundary between France and Germany. The Adige was to be the boundary of Austria in Italy. The independence of the Batavian, Helvetic, Cisalpine, and Ligurian Republics was guaranteed. A treaty was also concluded with Spain at Madrid on 21st March; and by the Treaty of Florence, 28th March, Naples agreed to renounce the coalition, and received French garrisons. Russia, Prussia, Denmark, and Sweden, formed an armed neutrality in opposition to the naval privileges claimed by England, which now maintained the war single-handed. This led to a brief war between England and the northern powers, except Prussia, which was terminated by the death of Paul I. On 31st August

General Menon, by a capitulation with the English, agreed to evacuate Egypt. Both England and France were now anxious for peace. Preliminaries were signed on 1st October, and the Peace of Amiens was concluded 27th March, 1802. France retained her continental conquests. Ceylon was ceded to England by Holland, and Trinidad by Spain; all the other conquests of Great Britain were restored. Malta, which had been taken by the English, was to be restored to the Knights of St. John.

Napoleon exhibited his wonted vigour in home administration. By means of the senate he silenced the opposition of the tribunate and the corps législatif. He superintended the preparation of the Code Civil. He entered into a concordat with Cardinal Consalvi for the re-establishment of the Catholic religion. He undertook public works, constructed roads and bridges, encouraged agriculture, manufactures, and commerce. On 2d August, 1802, Napoleon and his colleagues were made consuls for life, and the constitution was amended. The senate was enabled by the issue of *senatus consulta* to create organic laws, and to suspend the other bodies; the tribunate was reduced to fifty members and became a mere section of the conseil d'état. A privy-council was constituted, and the lists of Notables were replaced by electoral colleges chosen for life. This constitution was confirmed by another popular vote. The Cisalpine, now called the Italian Republic, had elected Napoleon its head. The Ligurian Republic allowed him to nominate its doge. Piedmont, united to France, formed seven new departments (11th September).

The external policy of Napoleon was not calculated to conciliate the jealousies caused by the extension of French dominion. The independence of the new republics was merely nominal. The Duchy of Parma and the island of Elba were occupied, and an armed intervention changed the government of Switzerland. By the Treaty of Lunéville the German princes dispossessed by the advance of the French boundary were to be indemnified beyond the Rhine. The process of compensation was not carried out with sufficient promptitude for Napoleon. By his interference, in conjunction with that of the Emperor of Russia, the indemnification was effected by the extinction of the two electorates of Cologne and Trèves, and the secularization of the ecclesiastical estates. Napoleon occupied St. Domingo, and sold Louisiana to the United States for 60,000,000 francs.

The discontent excited in England by this aggressive policy made it evident that the peace could not be maintained, and the government refused to evacuate Malta. On 16th May, two days before the declaration of war, an embargo was laid on all French and Dutch vessels in English harbours. Napoleon retaliated for this lawless proceeding by seizing as hostages all English travellers in France and Holland, and detaining them as prisoners till the peace, and General Mortier took military possession of Hanover. Russia and Prussia attempted to intervene, but on terms unacceptable to France. Spain and Portugal had to purchase their neutrality from France; but as this purchased neutrality placed the former at the disposal of France, England declared war with Spain. Naples was occupied by French troops, and vast preparations were made ostensibly for the invasion of England.

A conspiracy for the overthrow of Bonaparte and the restoration of the Bourbons was discovered in 1804, in which the British government was implicated. The most distinguished of the conspirators were Georges Cadoudal, the Chouan chief, Pichegru, and Moreau. Cadoudal was executed, Pichegru destroyed himself in prison, Moreau was pardoned, and retired to the United States. The Duke of Anglen, son-

pected of complicity in this intrigue, was arrested in neutral territory, in the Grand-duchy of Baden, brought to Vincennes, and executed.

The legislative bodies were now completely subservient to Napoleon, and the conspiracy of Cadoudal was made a pretext for offering him the empire, in order to assure the permanence of the government by giving it a hereditary head. The senate addressed him by a deputation, and on being invited to express their opinion voted the hereditary empire with four dissentient voices, among whom were Siéyès and Volney. In the council of state seven members supported the republic; in the tribunate there were only a few dissentients, among whom was Carnot. The *senatus-consultum* for the regulation of the empire, drawn up by Napoleon himself, was passed 18th May, 1804. The empire was confirmed by a popular vote of 3,572,329 against 2569.

The empire was made hereditary in the male issue of Napoleon and his adopted sons, his brothers Joseph and Louis following in the order of succession. The emperor was to have absolute authority over the imperial family. A civil list of 25,000,000 was assigned to the emperor, and 1,000,000 to each prince. A new aristocracy, not yet hereditary, was created. After the emperor came the grand dignitaries of the empire. The grand-electors (Joseph) was to convocate the legislative bodies; the arch-chancellor of the empire (Cambacérès) to superintend the courts of justice; the arch-chancellor of state to preside over the diplomacy of the empire; the arch-treasurer (Lebrun) over its finances; the constable (Louis Bonaparte) over the army; the grand-admiral over the fleet. These formed, in case of a minority, the council of regency. Two places were left vacant for two brothers of Napoleon in disgrace. A list of grand officers, also appointed for life, to the number of forty to fifty, followed. It included sixteen marshals of the empire (fourteen named), some special military and naval appointments, a grand-chamberlain (Talleyrand), grand-master of the hounds (Berthier), grand-querrier (Caullinour), grand-marshal of the palace (Duroc), grand-master of ceremonies (De Ségur). The fourteen marshals were—Augereau, Bernadotte, Berthier, Bessières, Brune, Davout, Jourdan, Lannes, Masséna, Moncey, Mortier, Murat, Ney, Soult; Kellermann, Lefebvre, Perignon, and Serrurier were made honorary marshals. The senate, besides eighty members elected by itself, was to comprise the six grand dignitaries of the empire, and the princes of the blood after eighteen years of age. A high imperial court was constituted to take cognizance of crimes against the safety of the state, the person of the emperor, and of offences committed by ministers or great persons of the state. On 4th July Napoleon distributed at the *Hôtel des Invalides* the grand decorations of the Legion of Honour, instituted two years before, to the chief personages of the empire. On the 16th of August he gave the crosses of the Legion to the soldiers in the camp of Boulogne, where in sight of the English fleet the preparations were going on for the invasion of England. The Channel, he afterwards observed, is a ditch which will be cleared when we have the audacity to try it. The pope was invited to the coronation of Napoleon, which took place at Notre Dame on 2d December, 1804. The emperor, after receiving the sacred unction from the pope, crowned himself, and afterwards the empress. On 26th May, 1805, he was crowned King of Italy.

Pitt had in the meantime been organising another coalition against France. A treaty was concluded between England and Sweden on 2d December. The Emperor Alexander, who had in the previous year strongly remonstrated against the usurpations of the

French government, and withdrawn from diplomatic relations with it, joined the allies on 11th April, 1805. Austria, which had long taken part in the consultations of the league, formally acceded to it on August 9. Austria had delayed to the last her adhesion to the coalition, because on her the brunt of the war was certain to fall. Prussia remained neutral. Austria opened the campaign with a powerful army in Italy under the Archduke Charles, and a German army under General Mack. A Russian and Swedish army was to operate in North Germany, and two Russian armies of 60,000 each were to join Mack on the Danube. The Austrian army crossed the Inn and entered Bavaria, which was in alliance with France, on September 9. Mack, who had about 80,000 men, without waiting for the Russians traversed Bavaria and took up a position on the Iller. Napoleon, who had resolved to deliver his principal attack in Germany, where the Austrians were weakest, turned Mack's right and crossed the Danube in his rear, and having cut off his communications shut him up in Ulm. Defeated in his attempts to escape the tolls, particularly by Ney at Elchingen (14th October), Mack capitulated with all his forces on 19th October. On 13th November Napoleon entered Vienna, where he found himself between two armies. On the right that of the Tyrol and Italy, which the Archduke Charles had led back in consequence of Mack's disaster, followed by Masséna, on the left the Austro-Russian main army with the two emperors (Austria and Russia) in Moravia. He moved immediately against the latter, and arrived at Brinn on 20th November, encountered the Austro-Prussian army, which was superior in number, at Austerlitz on 2d December, and inflicted on it a decisive defeat. An armistice was immediately concluded, and the Peace of Presburg, between France and Austria, signed on 26th December. Austria surrendered Venetia, Istria, and Dalmatia to France, the Tyrol to Bavaria, and Salsburg to Wurtemberg and Baden. The title of king was assumed by the Electors of Bavaria and Wurtemberg, and of grand-duke by the Elector of Baden. Napoleon was now able to carry out the plan he had contemplated of giving his empire a hereditary nobility. Joseph Bonaparte was created King of Naples and Sicily; Louis, King of Holland; Eliza, Duchess of Lucca; Pauline, Duchess of Guastalla; Talleyrand, Prince of Benevento; Bernadotte, of Pontecorvo; Berthier, of Neufchâtel; Murat, Grand-duke of Berg. Other territorial titles were bestowed upon his marshals and generals, and domains with hereditary succession set apart for their maintenance. While this great success was being achieved, Nelson in the battle of Trafalgar, 21st October, 1805, had almost annihilated the French and Spanish fleets. The Confederation of the Rhine, a league of German princes, under the protection of France, was signed at Paris on 12th July, 1806. On 6th August Francis II. abdicated the title of Emperor of Germany, the empire having been *de facto* dissolved.

Negotiations had been going on for peace with Russia; but the dissolution of the German Empire determined Alexander to continue the war. The formation of the Confederation of the Rhine was also looked upon as an affront by Prussia, and when Napoleon offered to restore Hanover, which he had bestowed on Prussia as the price of peace to England, the king and people were filled with rage, and war was determined on regardless of the hazardous circumstances in which it was undertaken. War was declared on 8th October. Napoleon was already at Bamberg directing his troops which had not left Germany. On the 14th the two armies met at Jena and Auerstedt, when the Prussians were totally defeated.

Napoleon entered Berlin on 27th October. Here he dictated on 21st November the celebrated decree declaring the British Isles in a state of blockade. All commerce in English articles was forbidden, all Englishmen on the Continent were rendered liable to arrest. A Russian army, about 90,000 strong, had already entered Prussian Poland. Napoleon arrived at Warsaw on 15th December, but nothing decisive occurred till the beginning of the year. The battle of Eylau, which was claimed as a victory on both sides, but which checked Napoleon's progress, was fought on 8th February, 1807. The surrender of Danzig having relieved a large body of French troops engaged in besieging it, a new campaign was begun, and on 14th June a decisive victory was gained by the French at Friedland. Separate armistices were immediately entered into with Russia and Prussia, and the Peace of Tilsit was concluded 7th-9th July. Prussia was compelled to cede nearly the half of her territory. The Kingdom of Westphalia was formed for Jerome Bonaparte of Hesse Cassel and the Prussian provinces west of the Elbe; the Grand-duchy of Warsaw for the King of Saxony of the Polish provinces of Prussia—some minor cessions were made in favour of Russia and other powers, and the Prussian army was restricted for ten years to 42,000 men. Russia recognized the new kingdoms created by Napoleon, and the Ionian Republic, of which Russia had guaranteed the independence, was given up to France. To secure the connivance of Alexander in his ambitious designs, and especially his co-operation against England, Napoleon gave up Finland to Russia, and she was encouraged to hope for the Danubian provinces of Turkey. Napoleon's idea seems to have been that the two emperors should divide between them the dominion of the civilized world; but he soon showed that he could not admit a partner except as a dependant. In the meantime the mediation of Russia was formally accepted for the negotiation of a peace with England, and that of France for a peace between Russia and Turkey; failing these, an offensive and defensive alliance was concluded, and a rigorous enforcement of the continental blockade was imposed both on Russia and Prussia.

While these events were going on the internal improvement of France had not been neglected. Paris had been adorned with numerous and splendid works of architecture, and supplied with water by the Canal d'Ourcq; roads had been made in La Vendée, across the Simplon, Mount Cenis, Mount Genèvre, &c; the port of Oberbourg had been excavated. Canals from Nantes to Brest, and from the Rhine to the Rhone, opened up important lines of interior navigation, and industry and commerce were encouraged. Among the glories of the Napoleonic epoch, however, cannot be placed that of literature. The hand of despotism pressed too heavily on the nation to permit of freedom of thought, and the constant drain of the youth of the country by the conscription was a heavy charge for a material progress which was being thus rapidly undermined.

The Peace of Tilsit led immediately to war between England and Denmark. Assured that the latter could not maintain her neutrality, the former insisted upon an alliance by which Denmark should be placed under the protection of Great Britain, her fleet carried to England for security, and her territory guaranteed. These extraordinary demands, which nothing but an extreme exigency could justify, were not complied with. Copenhagen was bombarded by the English fleet for three days, from 2nd to 5th September, and the Danish fleet and naval stores carried to England. The war between England and Denmark continued till 1814. Russia offered her mediation to England, but declined, on the invitation of the

English cabinet, to communicate the secret articles of the Treaty of Tilsit, and re-proclaimed the armed neutrality. War was consequently declared, and for five years Russia continued in the French alliance, and in hostility with England.

Portugal had generally joined the confederates against France, and Napoleon now determined to occupy it, with the intention also of overthrowing the government of Spain, which he could not trust; but in the meantime he entered into an alliance with Spain for the partition of Portugal. Junot entered Lisbon, 30th November, 1807, with the advance-guard of the French army. The pope being unwilling to carry out the continental blockade, and refusing to recognize Joseph as King of Naples, Rome was occupied, 2d February, 1808. The French troops had already entered Spain before the end of 1807; and in March, 1808, Murat with 100,000 men marched upon Madrid, which was entered on the 23d. By the Treaty of Bayonne, signed 5th May, Charles IV. resigned the crown of Spain, which Napoleon gave to his brother Joseph. The sovereignty of Naples was bestowed upon Murat. The Spaniards, whose government had been disposed of without their consent, everywhere rose in insurrection, and the military occupation of all the provinces of Spain became a necessity. The French troops met with various reverses. At Baylen, on 22d July, Dupont was compelled to capitulate with 15,000 soldiers. A British force, under Sir Arthur Wellesley, landed at Mondego Bay, defeated Junot at Vimeira, August 21, and compelled him to evacuate Portugal by the Convention of Cintra on the 30th. The progress of the Spanish insurrection brought Napoleon with fresh forces to Spain, and after successful engagements at Burgos, Espinosa, and Tudela, he entered Madrid on 2d December. He immediately decreed the abolition of the inquisition, the suppression of two-thirds of the convents, the cessation of feudal rights, and the abolition of internal customs. Catalonia was overrun by St. Cyr, while Soult expelled the English under Sir John Moore from Portugal (Coruña, 16th January, 1809).

The occupation of Napoleon in Spain gave Austria the opportunity she awaited of breaking the Peace of Presburg. On 27th March, 1809, a declaration of grievances suffered since the peace was delivered to the French government, and on 10th April the Austrian army crossed the Inn and occupied Bavaria. Napoleon, who had returned from Spain to prepare for the encounter, defeated the Austrians at Eckmühl on 22d April, and immediately advanced to Vienna. The Arch-duke Charles after his defeat also marched towards Vienna on the opposite bank of the Danube, and took up a position a short distance to the north of the capital. The French seized the island of Lobau, and throwing a bridge across the Danube, encountered the Austrians in the bloody and indecisive battles of Aspern and Essling. The French were forced after great loss to return to the Isle of Lobau, which Napoleon fortified, and awaited the approach of Eugene with the army of Italy. On 5th July he debouched with 150,000 men on the left bank, and on the 6th defeated the Austrians in the battle of Wagram. An armistice was signed at Znaim on 11th July, and on 14th October, 1809, was signed the Peace of Vienna (Schönbrunn), in which the *cessions* of the Treaty of Presburg were confirmed, and further cessions of territory made to France and her allies. An English expedition of some magnitude, known as the Walcheren Expedition, which might have had a powerful effect in Germany, misdirected against Antwerp, failed of effecting anything, and re-embarked in December.

Napoleon was divorced from Josephine on 16th

December, and married Maria Theresa of Austria by proxy, 11th March, 1810. The 'King of Rome' was born, 20th March, 1811.

The war continued in Spain throughout all the provinces. Saragossa had surrendered after a memorable siege on 20th February, 1809. The mutual jealousy of Napoleon's marshals, bound to the service of an ambitious master rather by the tie of self-interest than of patriotism, always interfered in his absence with the unity of their operations; but the force wielded by them was too great for the undisciplined and ill-organized bands of the Spanish junta. In Portugal a somewhat better organization prevailed. A forced levy was made, and twenty-four regiments were taken into British pay. Sir Arthur Wellesley landed at Oporto with an English force on 22nd April, 1809, and, uniting with the Portuguese under Beresford, compelled Soult to evacuate Portugal. He then formed a junction with the Spanish general Cuesta, and marched on Madrid. He met the forces of Joseph under Victor and Jourdan at Talavera de la Reina, 27th-28th June, and defeated them; but the advance of Soult, Ney, and Mortier to the protection of the capital compelled him to retreat to Badajoz.

In 1810 Napoleon, freed from other wars, had concentrated an overwhelming force in the Peninsula, and Wellington defended himself in his famous lines of Torres Vedras, near Lisbon, into which he retired in October, after contesting every position on the way. He was followed by Massena, who, in the beginning of March, 1811, was compelled to retire by want of provisions. Wellington followed, and defeated him at Fuentes de Onoro on 8rd and 5th May. On 16th May Soult was defeated by Beresford at Albuera. Suchet had in the meantime been carrying on a successful war in Catalonia, and earned his marshal's baton by the capture of Tarragona. Wellington captured Ciudad Rodrigo on 19th Jan. 1812, defeated Marmont at Salamanca on 22nd July, and entered Madrid on 12th August. While these events were going on, war was preparing elsewhere on a larger scale. Napoleon, with all his clear-sightedness and strength of mind, had not escaped the intoxication of success. After Wagram, Cambacérès observes, 'il avait l'air de marcher au milieu de sa gloire'. The continental system had been insisted on with such rigour that his brother Louis resigned the throne of Holland, 3rd July, 1810, rather than carry out his instructions, and Holland had been united to France. The Milan decrees (17th Dec. 1807) declared every vessel which had touched at an English port to have lost its nationality, and ordered all English merchandise found on the Continent to be burned. The Hanseatic towns—Bremen, Hamburg, and Lübeck—were added to the empire by decree of 18th December, 1810. It now became more than ever an object with Napoleon to shut the ports of Russia, and he insisted upon this in as harsh and arbitrary a manner as if Alexander had been his vassal. So oppressive had the system become that Napoleon himself had been compelled to issue licenses for trade between France and England. From the close of 1810 Russia had partially departed from the blockade by admitting colonial produce in neutral vessels. Napoleon demanded that such vessels should be confiscated. Russia, he said, must return to the position of subordination in which it was placed by the Treaty of Tilsit. The czar on his part had entered into an alliance with Sweden, of which country Bernadotte had been elected crown-prince, and secured peace with Turkey; and on 8th April, 1812, he demanded the evacuation of Old Prussia, the duchy of Warsaw, and Swedish Pomerania, and a relaxation of the continental system.

In the war now imminent Prussia and Austria entered on compulsion into the alliance of France, with the obvious intention of deserting her whenever she should meet with serious reverses. The alternative with Austria was alliance or disarmament, and she supported France with a portion of her forces in order that she might be able at the proper moment to turn against her with the whole.

On the 16th of May Napoleon arrived at Dresden, and took up his residence at the royal palace, where he was waited on by the Emperor of Austria, the King of Prussia, and other German princes, who expressed the utmost devotion to him. Negotiation having proved fruitless, he made here his final arrangements for the campaign. The army he had organized for it has been estimated at from 640,000 to 680,000, including auxiliary forces. The principal army of the Russians, 130,000 strong, under Barclay de Tolly, was to cover the route to St. Petersburg, resting on the Dwina; another, under Bagration, to cover Moscow on the line of the Dnieper, and threaten the flank of the invading army.

Napoleon crossed the Niemen at Kovno on 24th June, and entered Vilna on the 28th, where he was detained seventeen days arranging the commissariat of his army. He beat the rear-guard of Barclay's army at Ostrovo, 25th July, and occupied Vitebsk on the 28th. Smolensk, where Barclay had formed a junction with Bagration, was captured on 17th August. The army now advanced towards Moscow; and Kutusoff, who had superseded Barclay, gave battle at Borodino on 7th September, to defend the ancient capital of Russia, when he was defeated with a loss of nearly 30,000 to the victors, and almost double that number to the vanquished. After this fatal battle the French entered Moscow on the 16th, but during the night the city, which had been deserted by its inhabitants, was found to be in flames. The conflagration lasted five days, and destroyed a great part of the city. Napoleon now attempted to negotiate with Alexander, but without result. It was impossible to pursue the Russians further, and the capture of their capital had not produced the moral effect he anticipated. Nothing remained but to retreat. He left Moscow on 19th October with 80,000 men, leaving 10,000 behind as a garrison. At Malo-Jaroslavitz, on the 24th, he had a sanguinary conflict with the Russians. On 6th November, when the army had reached Dorogobush, intense cold set in, and from this point thousands perished on the way. On 9th November only 40,000 to 50,000 men reached Smolensk, and the arrangements which Napoleon had made for victualling the army had not been carried out. Three Russian armies threatened to cut off the passage of the Beresina, which was effected with heavy loss on the 27th. At Smorgoni Napoleon quitted the army to return to Paris, leaving Murat to conduct the retreat. The remains of the army recrossed the Niemen on 20th December. Ney, who commanded the rear-guard, was the last to cross the Bridge of Kovno.

The return of Napoleon to Paris was necessitated by the impending formation of another European coalition. Austria, Russia, and Prussia had successively looked on, while each in turn had sacrificed itself to the divided counsels inspired by dread of French ascendancy and of the genius of Napoleon; but now, when Russia had set the example of a heroic defence, a really European combination was to be formed against the common oppressor.

A formal declaration of war was made by Prussia on 27th March. Napoleon, availing himself of the wonderful command which the French system of conscription gave him of the resources of the country, raised a new levy of 200,000 men, and was ready before

the allies. He assumed the command of the army at Erfurt on 25th April. He had still 850,000 men in Germany, and Austria did not yet deem it prudent to join the coalition. He defeated the allies at Lützen, 2nd May, forced them to cross the Elbe, and entered Dresden on the 8th. On 21st May he again defeated them at Bautzen, and reached Breslau on 1st June. On the 4th he concluded an armistice for six weeks at the village of Poischwitz, near Jauer, in Silesia. As his preparations were more forward than those of the confederates, and his allies could only be depended on in the event of success, this step was of fatal omen. Little could be hoped for from negotiation, and it was already certain that he should have Austria to reckon among his enemies. A congress under the mediation of Austria was opened at Prague on 26th July, but it only resulted in the foregone conclusion of the accession of that power to the coalition. By the Treaty of Toplitz, signed 9th September, a formal alliance was entered into between Austria, Russia, and Prussia; but on the reopening of the campaign, 16th August, they had already arranged a joint plan of operations, and appointed Prince Schwarzenberg commander-in-chief of their combined forces. The allies could now bring from 500,000 to 600,000 men into the field, while Napoleon commanded about 360,000. The whole operations, of course, were extended over a vast area, but the main army of the allies advanced upon Dresden. The battle of Dresden, 26th-27th August, was again a victory for Napoleon, but fatal mistakes were committed, and disastrous defeats of separate corps sustained after it. The surrender of Vandamme in particular, with the remains of a corps of 30,000 men, more than counterbalanced the victory. A large portion of the French armies was composed of German troops, who were daily deserting to the enemy. On October 1st Bavaria seceded. The allied armies were gathering near Leipzig. In these circumstances Napoleon abandoned Dresden, and concentrated his army about Leipzig (15th October). He held this city with 190,000 men, while the allies with about 330,000 formed a semicircle around him. After some preliminary fighting, not disadvantageous to the French, on the 16th, the great battle of the campaign was here delivered on the 18th and 19th. Early on the first day the Saxons and Württembergers passed over to the allies on the field of battle—a species of treachery which no circumstances can justify. On the second day the French fought only to cover their retreat, which was made more disastrous by the want of bridges over the Elster. This victory of the allies led to the retreat of the French over the Rhine, which was not effected without further combats. The fortresses held by them in Germany and Poland, which occupied 100,000 men, were gradually reduced.

Wellington in the meantime had continued his successes in the Peninsula. He defeated Jourdan on 21st June, 1813, and followed Soult, who succeeded him, after a series of successful engagements, to Bayonne, which he invested in December.

The southern territory of France was thus actually invaded, when, in 1814, the allies prepared for its invasion from the north. Napoleon on his return had made vigorous preparations for the invasion, and had ordered a fresh levy of 300,000 conscripts. A voice, however, had been found even in France and in the servile corps législatif to complain of despotism and perpetual war. The allies crossed the frontier in two bodies—the army of Silesia, under Blücher, crossing the Rhine; the grand army, under Prince Schwarzenberg, passing through Switzerland. Both armies entered France in January. Napoleon's defence ranks among the most skilful of his many cam-

paigns; but in spite of the desperate combats delivered at Vitry-le-François, St. Didier, Brienne, Montmirail, Arcis-sur-Aube, &c., the allies steadily advanced, and after a combat sustained in its defence by Marmont and Morier, Paris surrendered on 31st March. Napoleon abdicated in favour of his son (6th April), but the allies required an unconditional surrender, and assigned him the sovereignty of the Isle of Elba, to which he was conveyed in a British vessel (April 20-May 4). Louis XVIII. was now proclaimed King of France, and a constitution having been arranged, the Peace of Paris was signed 30th May, and the allies immediately evacuated France.

The successes of Napoleon had disorganised the whole of Europe, and a congress had assembled at Vienna to adjust the claims of the various powers, when it was announced that Napoleon had left Elba, returned to Paris (20th March, 1815), and been reinstated without resistance in his former authority. Hereupon the allied sovereigns declared him an outlaw and a disturber of the peace of the world, and renewed their alliance against him.

Napoleon had proposed to remain at peace and govern constitutionally, but his past achievements afforded no guarantee for the safety of this experiment, and he was not allowed to make it. As it was evident the allies would bring a preponderating force into the field, his only chance was to anticipate them. On 15th June he crossed the Sambre with 130,000 men to attack the English and Prussians, who were preparing to invade France on the Belgian frontier while the Austrians attacked it on the Rhine. He encountered the Prussians under Blücher at Ligny, while Ney held the English in check at Quatre-bras (16th June). Blücher was forced to retreat, and Napoleon marched against the English, who had taken position at Waterloo. Here, on the 18th, was fought the decisive battle which resulted in his final overthrow. The allies advanced without opposition to Paris. Napoleon again abdicated in favour of his son (22d June), but being threatened by Fouché, who had assumed the direction of the government, he surrendered to the British (5th July). He was sent by the decree of the allies to St. Helena, where he died 5th May, 1821.

A convention was signed by Davout (July 3), by which the French army was to retire behind the Loire, and the allies entered Paris. Louis XVIII. was again proclaimed, and the allies continued in military occupation of France till 1818. By the first Treaty of Paris (30th May, 1814) France was reduced to her limits of 1792, with the addition of a part of Savoy, and some cantons added to the departments of the Ardennes, Moselle, Bas-Rhin, and Ain. She recovered her colonies with the exception of Tobago, St. Lucia, and the Isle of France (Mauritius). By the second Treaty of Paris between France and the allies she lost Philippeville, Marienburg, the Duchy of Bouillon, Saarlouis, Saarbrück, the two banks of the Sarre, the country north of the Lauter and part of the county of Gex; and the Holy Alliance entered into between Russia, Austria, and Prussia became for a time a guarantee against future aggressors.

Louis XVIII. at first governed with the support of a moderate Liberal party, but the assassination of the Duke of Berry, 13th Feb. 1820, threw him into the hands of the reactionary party. The ministry of Villèle allied itself with the clergy to restore the royal authority in its ancient prerogatives. Secret societies (see CARBONARI) began to spread in France, with ramifications in Germany and Italy, where despotic governments also prevailed. Several insurrections took place, and some of the leaders suffered capital punishment. This ministry also undertook an expedition to Spain, to repress the opposition

of the Liberals of that country to Ferdinand VII. (1823).

Louis XVIII. died 16th September, 1824, and was succeeded by his brother Charles X., who had always been the head of the ultra-royalist party. In 1827 a joint expedition was undertaken by England, France, and Russia in favour of the Greeks, who had thrown off the yoke of Turkey. The elections of 1827 gave a majority to the Liberals, and a moderate government was formed under Martignac. It was displaced by the Polignac ministry, a reactionary government, in August, 1829. An expedition was sent against Algiers under Count Bourmont, which captured the city 5th July, 1830, and formed the beginning of the French colony of Algiers. On 26th July ordinances were published suppressing the liberty of the press, and creating a new system of elections. An insurrection in Paris during the three days 27th-29th July overthrew the royalty of Charles X., and Louis Philippe was proclaimed king, 9th August, 1830.

The appointment of Louis Philippe by the chamber of deputies was peculiarly acceptable to the bourgeoisie or middle classes, and, notwithstanding some occasional outbursts of republicanism, the insurrection in favour of the infant prince called Henry V., and known under the title of Count de Chambord, which was headed by his heroic mother, the Duchess de Berri, and two abortive attempts to grasp the reins of power by Louis Napoleon, the July monarchy, as it was called, lasted eighteen years. It was the policy of Louis Philippe to amuse the populace and flatter the national vanity by active foreign intervention. In 1832 an expedition was sent out to drive the Dutch garrison out of the citadel of Antwerp, which should have been given up to Belgium by Holland in accordance with the Treaty of London. After an obstinate siege the French gained possession of the citadel. In the same year France seized Ancona to counterbalance the influence of the Austrians in Italy, and in 1835 the Algerine war was successfully terminated by the costly acquisition of Algeria. But by degrees the policy of the citizen king, as he was called, was changed; the government proved reactionary at home and devoid of energy abroad; the material prosperity which had marked a great part of the reign was suddenly checked by the scarcity of the harvests and the high prices of 1847. In the middle of that year Guizot, the king's chief minister, declared himself as averse to all organic changes in the state while a strong opposition was insisting on reform. At last, on the 24th Feb. 1848, another bloody revolution broke out by which the Orleans family was exiled. A republic was set up without consulting the voice of the country at large. The bourgeoisie would have undoubtedly preferred the continuation of a constitutional monarchy, but for a time sailed with the stream and professed their readiness to give the republican form of government a fair trial. In the course of a few months, however, their representatives in the constituent assembly, frightened by socialist movements, gave marked evidence of their strong opposition to it. A so-called republican constitution was adopted, and on the 10th Dec. 1848 Louis Napoleon was elected president of the French Republic for a term of four years by a majority of more than 4,000,000 over General Cavaignac.

The president immediately set about gaining the favour of the army, in which he was completely successful, and when the dimensions in the legislative assembly became apparently dangerous to a continuance of his arbitrary power he dissolved it, 2d Dec. 1851, and appealed to the people, asking their sanction for what he had done. Various ill-

concerted attempts at armed resistance were repressed by energetic and bloody measures, and the president, who had all the elective machinery of the nation completely under control, was confirmed in his office for a further term of ten years by 7,839,216 votes; and a new constitution similar to that of the Napoleonic consulate of 1799 was promulgated. At length, on the 7th Nov. 1852, a *senatus consultum* proposed the re-establishment of a hereditary empire, and another appeal was made to the nation under the same coercive system and with similar success. On the 2d December, strengthened by the votes of 7,824,129 citizens, the empire was proclaimed and Louis Napoleon declared emperor under the title of Napoleon III. In 1853, Russia having invaded the provinces of Moldavia and Walachia under the pretext of securing protection for the adherents of the Greek Church against Turkish intolerance, France and England, having guaranteed the integrity of the Ottoman Empire, declared war against Russia on the 27th April, 1854, and sent a combined fleet to the Black Sea. The Anglo-French armies were landed in the Crimea, 14th Sept. 1854, and the battles of the Alma (20th Sept.), of Inkermann (5th Nov.), and, finally, the capture of Sebastopol (8th Sept. 1855), led to the Treaty of Paris (30th March, 1856), which secured in a great measure the objects for which the allies had gone to war. The Austrian invasion of the Sardinian states, in 1859, brought France once more into the field, as an ally of the latter. The victories of the Franco-Piedmontese armies at Montebello (20th May), Magenta, Marignano, and Solferino (4th, 8th, and 24th June) deprived Austria of Lombardy, which was ceded to Piedmont. The French obtained, as a recognition of their powerful assistance, the territories of Savoy and Nice (10th March, 1860). In 1860 the French sent out an expedition to China to act in concert with the British, who were determined to enforce the Treaty of Tien-tsin, by which provision had been made for the permanent residence of their ambassadors in Peking. After some severe fighting the allies entered that city on the 12th Oct., and the Chinese emperor submitted to the terms dictated by the conquerors. Another distant expedition undertaken by France was less fortunate in its ultimate results. For some years Mexico had been the theatre of civil war carried on by the so-called clerical party headed latterly by President Miramon, and by the liberal party headed by the rival President Juarez. A temporary suspension of the payment of indemnities due to France and England led to the intervention of the European powers. It was soon evident that France had ulterior objects in view; the extravagant demands of M. de Soligny and the presence of Miramon in the French camp rendered negotiation impossible, and England and Spain formally withdrew from further intervention. In 1862 war was declared by France against Juarez, who was driven across the frontier. The government of the country was handed over to Maximilian, archduke of Austria, who assumed the title of Emperor. Supported as this prince was by French troops he could not preserve tranquillity in his dominions, and Napoleon began to recognize the grave position in which he had placed himself. The United States, moreover, who had always favoured Juarez, brought strong diplomatic pressure to bear on the French emperor, and in the autumn of 1866 he began to withdraw his troops from Mexico. On the conclusion of the Austro-Prussian war in 1866 Napoleon, alarmed at the growing power of Prussia, demanded a reconstruction of frontier, claiming by way of compensation for his neutrality on that occasion Prussian territory on the Saar. This was peremptorily refused

by Prussia. The ill-feeling between that nation and France was further increased in 1867, when the King of Holland signified his intention to cede Luxemburg to France. The cession was strongly resisted by Prussia, and at a conference held in London (7th-11th May) the duchy was neutralized. It was now, however, evident that a rupture between France and Prussia was imminent, and in 1870, on the Spanish crown being offered to Prince Leopold of Hohenzollern, France demanded that the King of Prussia should compel him to refuse it. Notwithstanding the subsequent renunciation of the crown by the German prince, war was declared by France (19th July). (See FRANCO-GERMAN WAR.) The disastrous surrender of the emperor and his army at Sedan (Sept. 2nd) was fatal to the second empire. On the following day the French republic was proclaimed and the government of national defence formed. After an almost uninterrupted series of victories the Germans became masters of the French capital (28th Jan. 1871). On the 26th February the preliminaries of peace were signed, by which France renounced the fifth part of Lorraine, including Metz and Thionville, and Alsace, less Belfort, and agreed to pay a war indemnity of five milliards of francs (£200,000,000). A definite treaty of peace was signed at Frankfurt on the 10th May, and on the 18th was ratified by a French assembly elected for the purpose. Meanwhile civil war had broken out in Paris, and was suppressed with great difficulty. (See COMMUNE OF PARIS.) The assembly, whose authority ought to have expired with the ratification of the peace they were expressly called together to pronounce, should have now dissolved, but this was impossible during the war of the Commune, and it was impracticable to appeal to the confused voice of the country when the pressing need was to restore tranquillity and give the nation time to think over the situation. Therefore the *pacte de Bordeaux*, the tacit understanding on which the assembly had been authorized to act, was ignored, and the deputies, who had elected Thiers, a former minister of Louis Philippe, president of the republic, continued to sit at Versailles. The Thiers administration, which lasted until the 24th May, 1873, set vigorously about wiping off the war debt, and thus freeing French soil from the invaders, which was eventually accomplished in the first half of the following September. Although throughout the whole period the nation had been singularly tranquil and prosperous, and was fast attaining her former place among the great powers, the conservative faction in the assembly, professing to be alarmed at the spread of radicalism and socialism, offered on various occasions violent opposition to the government, and at last effected its fall, Thiers being succeeded by Marshal MacMahon. Under his and the preceding régime intrigues of more or less importance were carried on in the interest of one or other of the competitors for the crown, the most nearly successful being that of the adherents of the Comte de Chambord, or, as he was called by the legitimists, Henry V. This prince, however, destroyed all his chances of success by his extravagant pretensions to all the prerogatives enjoyed by his ancestors, the Bourbons. The consequence of this failure was the prolongation of MacMahon's powers as president for seven years by a vote in the assembly, 19th Nov. 1873. France, after remaining for several years without any settled form of government, at last, in 1875, had a republican constitution drawn up for it by the national assembly elected in 1871. Its principal provisions have already been given above. MacMahon held the post of president for nearly six years, but, finding his position too unpleasant to retain, he resigned, Jan. 30, 1879. Jules Grévy was elected as his successor, and he in turn

was succeeded by Sadi-Carnot in 1887. In June, 1894, President Carnot was assassinated by an anarchist while passing through the streets of Lyons. Casimir-Perier was chosen to the vacant office, but in January, 1895, he resigned, and was succeeded by Félix Faure. During M. Faure's tenure of office, which ended with his death in 1899, an alliance was concluded with Russia. He was succeeded by Émile Loubet. In 1881 France invaded Tunis and established a protectorate there. In 1883-84 possession was taken of Tonquin and a protectorate established over Anam, proceedings which led to hostilities with China. The Kingdom of Dahomey was, in 1893, proclaimed a French Protectorate, and in the following year the dethroned king's disaffection was suppressed by a military expedition. France had long claimed a protectorate over Madagascar, but disputes with the Malagasy government ultimately led to war, and in 1895 to the total defeat and submission of the Hovas. During the last decade of the nineteenth century she largely increased her possessions in north and western Africa. An attempt to occupy Fashoda and the Bahr-el-Ghazal valley in 1898 nearly led to war with Britain, but by a convention concluded early in 1899 she resigned her claims to the disputed territory and to Darfur and Kordofan. From 1897 till 1899 France was profoundly agitated by the demonstrations and developments which took place in connection with the attempt to secure a revision of the trial of a Captain Dreyfus, who had been banished in 1894 for alleged treason. Revelations damaging to the heads of the army were made, and at times revolution seemed imminent. See DREYFUS IN SUPP.

The following table, showing the dates at which the great fiefs and various foreign territories were united to the crown, will give an idea of the growth of the French Kingdom. In referring to this table it must be remembered that many of the fiefs were not united directly to the crown, but to some other fief, and that these are therefore in most cases not mentioned; and also that many, after being united to the crown, were afterwards detached, in which cases only the final annexation is given.

Table giving the Dates of the Union of the Great Fiefs and various Foreign Possessions to the French Crown.

Kings.	Dates.	Territories.	Designation.
Hugh Capet....	987	County of Paris.....	Fief.
	1229	County of Carcassonne ..	"
Louis IX.	1229	County of Béliers.....	"
	1229	County of Nîmes.....	"
Philip III.	1272	County of Toulouse.....	"
Philip IV.	1308	County of Lyon.....	"
	1328	Barony of Cham- pagne.....	"
Philip VI.	1328	County of Bré.....	"
	1349	Dauphiné de Vi- ennols.....	"
Charles V.	1377	Guienne.....	"
Charles VII.	1423	Poitou.....	"
	1465	Berry.....	"
	1468	Normandy.....	"
	1477	Bourbonnais.....	"
Louis XI.	1477	Burgundy.....	"
	1477	Barluc.....	"
	1480	Anjou.....	"
	1481	Maine.....	"
	1481	Provence.....	"
Louis XII.	1496	Orléannais.....	"
	1496	Valois.....	"
	1515	Angoulême.....	"
	1525	Alençon.....	"
	1525	Le Perche.....	"
	1581	Dauphiné d'Auvergne.....	"
Francis I.	1581	Duché d'Anjou.....	"
	1581	Bourbonnais.....	"
	1581	Forez.....	"
	1581	Beaujolais.....	"
	1581	La Marche.....	"
	1582	Brittany.....	"

Kings.	Date.	Territories.	Designation.
Henry II.,....	1565	Calais and district.	Foreign possession.
	1569	Bishopric of Metz, Toul, and Verdun.	"
Henry III.,....	1583	Evreux.....	Fief.
	1589	Béarn.....	"
	1589	Armagnac.....	"
	1589	Foix.....	"
	1589	Albret.....	"
Henry IV.,....	1589	Bigorre.....	"
	1589	Vendôme.....	"
	1589	Péragord.....	"
	1589	Limoges.....	"
	1589	Kingdom of Navarre.....	Independent kingdom.
Louis XIII.,...	1601	Bresse.....	Fief.
	1615	County of Auvergne.....	"
	1642	Principality of Sedan.....	Foreign possession.
	1659	Artois.....	"
Louis XIV.,....	1659	French Flanders.....	"
	1678	County of Burgundy (Franche Comté).....	"
	1697	Strasbourg and district.....	"
	1713	Principality of Orange.....	"
Louis XV.,....	1766	Lorraine and Bar.....	"
	1769	Corsica.....	"
Louis XVI.,....	1789	Valentignis.....	Fief.
Emperor Napoleon III.,...	1860	Savoy.....	Foreign possession.
	1860	Nice.....	"

French Language.—At the time of the conquest of Gaul by Julius Cæsar, the principal dialects spoken by the inhabitants were the Celto-Teutonic of the Belgæ, the Celto-Iberic of the Aquitani, and the Celtic proper used in the centre of the country. The Roman language overwhelmed all these idioms. It would appear that in the fourth or fifth century, the whole of Gaul, from the Rhine to the Pyrenees, with the exception of Brittany, had adopted the language of the conqueror—not the *sermo urbanus* of the classic writers, but that form of Latin which, of course with dialectical variations, had become common to all the subjugated provinces of Central Europe—the *lingua Romana rustica*. On the overthrow of the Western Empire this language was modified by the mixture of words and expressions originally Frankish, Burgundian, Ostrogothic or Visigothic. This Theotiscan or Tudescan element was naturally more prominent north of the Loire. Probably the most ancient monument of this dialect is the oath of Louis the German to Charles the Bald, who, in his part, swore in German, in Strasbourg, February, 842. For comparison's sake we subjoin the translation in modern French:—

Pro Deo amur et pro christian poble et nostro commun salvement, d'ist di in avant in quant Deus savir et potir me dunat, al salvarai lo cist meon fradre Karlo, et in adjudha et in ocdhuna cosa, si cum om, per dreit, meon fradre salvar dist in o quid il mi altret faset; et ab Ludher nul plaid nunquam prendrai qui, meon vol, cist meon fradre Karle in damno sit.

Pour l'amour de Dieu et pour le peuple chrétien et notre commun salut de ce jour en avant (d'ordavant), en tant que Dieu me donnera de savoir et de pouvoir, je soutiendrai mon frère Charles qui voudra, et par aide et en toute chose ainsi qu'il on doit, par devoir, préserver son frère, pourvu qu'il en fasse le même pour moi, et ne prendrai jamais avec Lothaire aucun accommodement qui, par ma volonté, soit au préjudice de mon frère Charles ici présent.

This mixed idiom, known under the name Franco-Romana, early branched off into two characteristically different forms: the *Langue d'oc*, or the *Provençal* of the south; and the *Langue d'oïl*, or *Roman Wallon* of the north. These languages owe their names to their respective terms for expressing *yes* (French, *oui*). The *Langue d'oc*, more sonorous, more harmonious, and more poetic than the sister

tongue, rapidly developed itself. It became the court language of the kings of Arles, who ruled over provinces more Romanized and less harassed by barbarian invasions than the territory of the dukes of Normandy, where the *Langue d'oïl* had its home. This was the age of the *Troubadours* of the south, who sang of love in melodious strains, and dwelt on the charms of a southern clime and a fruitful soil; of the *Trouvères* of the north, who invented a chivalrous mythology of their own, and ascribed to the heroes of Greece and Rome, and the courtiers of King Arthur and Charlemagne, the sentiments of their own times. The complete development of poetry in Provence was checked by the persecution of the Albigenses, the language of the Troubadours was proscribed, and along with the political rule of the north, a sub-dialect of Picardy, spoken in the Ile de France, extended towards the south. The real French language began to be developed about the beginning of the thirteenth century. Its sway was increased in that century by the extension of the crown lands; in the fourteenth by the growing authority of the house of Capet, the organization of the royal courts of justice and the parliament of Paris; in the fifteenth by the establishment of a military and fiscal system, but above all, by the invention of printing; and in the sixteenth the formal ordinances of François I. forbade the use of any other language than French in the courts, and in public and private documents. The Académie Française established by Richelieu in 1635 for the regulation of the national language, the influence of the court, the labours of the Port Royalists and the writers of the memorable era of Louis XIV. purified, augmented, and diffused it more and more. It was first used as a diplomatic language at the conferences of Nimeguen, in 1678. Owing to its admirable clearness and precision, and its wealth of happy colloquial phrases, together with the fame of its great writers, and the important part France has continued to play on the stage of Europe, this language has now generally become the first a man of the world learns to speak after he has mastered his mother tongue.

Literature.—The earliest monuments of French literature are the productions of the Troubadours, who flourished during the eleventh and twelfth centuries. Their poems consist for the most part of short lyrical effusions of an amatory cast. Thibaut, the king of Navarre, sang in the service of his lady-love as a Troubadour. But we cannot help looking at the poetry of this epoch as a display of ingenuity and wit, rather than as the expression of passion and deep feeling. On the other hand, the Trouvères, who flourished at a somewhat later period, treated in their narrative poems (the *chansons de geste*) of national subjects, and celebrated the deeds of renowned kings and knights. These romances or chansons de geste are numerous, and have been divided into three cycles. The first narrated the deeds of the great Frankish emperor Charlemagne, his descendants and vassals; one of the oldest and best of this category of romances being the *Chanson de Roland*. The Armoric or Arthurian cycle consists of the poetical forms of the legends connected with ancient Britain and the achievements of the Norman warriors; the *Roman de Brut*, or that of king Arthur; and the *Roman de Rou*, or that of the dukes of Normandy, are the double foundation on which all the poems of this series rest. The third or Alexandrine cycle consists of poems in which the recollections of Greece and Rome are strangely enough mixed up with chivalric notions and legends of fairyland. *Le Geste de Troie*, by Benoit de St. More; the *Alexandre* by Lambert le Cors and Alexandre of Paris; the *Médec*, and the *Ulysse* by Raymond du Bosquet, are

fair examples of this class. Almost contemporaneous with the chansons de geste, and related to them as comedy or farce is to tragedy, sprang up the fabliaux, short, humorous, satirical, poetic tales, a species of literature which obtained its highest perfection and greatest popularity in France. One of the most celebrated of fabliaux writers is Rutebeuf, a contemporary of St. Louis. But by far the most notable production of this nature is the Roman de Renard, the composition of different hands and even of different ages. This satiric epicope throws an air of ridicule over all classes and institutions of the time, king and priest, knight and judge, court and cloister, tourney and pilgrimage. The spirit of the poem is the negation of that of chivalry, the vital principle of the middle ages. The progress of prose was slower than that of poetry. The earliest specimens are furnished by the monkish chroniclers, the most noteworthy being the Chroniques de France selon qu'elles sont conservées à St. Denis. It was, however, the genius of a layman that made history the rival of poetry, and the Histoire de la Conquête de Constantinople (1802), by Villehardouin, an eyewitness, may be regarded as the first example of genuine French historical literature. This was followed by the Mémoires, in which Joinville (1223-1317) tells with winning naïveté the heroic deeds and private virtues of the good king Louis IX.; by the Chroniques de Froissart (1337-1410), which present the most animated pictures of society and manners of that period of war and gallant enterprise. By the Mémoires of Philippe de Commines (1445-1509) we are introduced to Louis XI. and his contemporaries, and we have striking evidence that the chivalrous poetic spirit of the middle ages had now fairly given way to shameless trickery and deep cunning. The race of the Trouvères may be said to have ended with Charles, duke of Orleans (1391-1465), whose graceful gallantry finds a strong contrast in the easy, unblushing impudence of Villon (1431-1500). The revival of classic learning and the reformation of religion exercised a powerful influence on the French literature of the sixteenth century. Its principal characteristics being freedom of thought and variety of style, writers cannot be judged by a single standard. In originality Rabelais (1483-1553) and Montaigne (1533-92) hold the first rank. The former was a profound scholar, physician, and philosopher, yet contented himself with the renown of a profane humorist. His *Vie de Gargantua et de Pantagruel* is filled with strange tales, wild notions, and gross buffooneries, good sense, sound philosophy, and keen reasoning. As learned, as witty, and as sceptical as Rabelais, but wanting his coarseness, Montaigne lived a quiet, easy life, while France was being torn by civil war; writing his charming *Essais*, ridiculing the bigotry of the Catholic and the Protestant, the enthusiasm of the soldier, the trickery and pedantry of the judge; inclined to laugh at human imperfections rather as weaknesses than to storm at them as vices. These essays are a series of free and familiar disquisitions on every subject, and are one of the standards of French literature. Meanwhile the Reformation had been vindicated by Calvin (1509-64) in his *Institution de la Religion chrétienne*, a masterly production, which afforded convincing evidence that French prose had now acquired strength and gravity to become a fit vehicle of religious eloquence. Later in the century the admirable pamphlet the *Satire Ménippée*, and the speeches of Chancellor L'Hôpital, proved it to be flexible enough for political purposes. Amyot (1513-98) had invested it with new graces by happily blending French and Grecian beauties in his translation of Plutarch's *Lives*; its capacity for lighter

themes had been previously demonstrated by the *Heptaméron* of Queen Margaret of Navarre (1492-1549). In poetry this period was less successful. Clement Marot (1495-1544) had indeed exhibited grace, elegance, and wit in his epistles, epigrams, and elegies; Ronsard (1524-85) attempted to invest French verse with that dignity and variety which he admired in the Greek metres, but his violent introduction of foreign forms and elements into the vernacular obtained scant success. The *Cléopâtre* of Jodelle (1532-78) may be considered as the first drama of importance placed on the French stage. In the beginning of the next century the simplicity and ease of the verse of Regnier (1573-1613), and the correct and pure but somewhat cold and formal style of Malherbe (1556-1628), paved the way for the masters of the succeeding generation. Balzac (1584-1684) devoted his attention to the improvement of prose, his epistles especially being valuable at the time as models of harmonious rhetoric. Such were also the letters of his friend Vauvray (1598-1648), affected and frivolous as they often are. Both were great favourites at the Hôtel de Rambouillet, the head-quarters of French euphuism and of the *Précieuses*. Out of another of these social reunions, which were more of the nature of literary clubs, Richelieu founded the French Academy (1635); but it was outside all such coteries that France was to find the great poet who was to usher in the glories of her Augustan age. Pierre Corneille (1606-84), with his *Cid*, *Cinna*, *Horace*, and *Polyeucte*, brought French tragedy to a degree of grandeur which it has not surpassed. Pascal (1623-62) blends all the caustic irony of a satirist with the rapt inspiration of a saint in his *Lettres à un Provincial*, the latter element alone being present in his fragmentary *Pensées*. Descartes (1596-1650) showed in his *Discours sur la Méthode* that the language was now equal to the highest philosophical subjects. Among the historical works of this period may be mentioned the *Mémoires* of Brantôme (1527-1614) and of the Cardinal de Retz (1604-79), and the *Economies Royales* of Sully (1560-1641). We have now reached the golden age of French literature, the *Siècle* de Louis XIV. Foremost among the poets stand Boileau Despréaux (1636-1711), the author of the nine famous satires, of the *Art Poétique*, and of the *Lutrin*; La Fontaine (1621-96), the prince of fabulists, from whom we have a series of rather indelicate *Contes*, and the most charming collection of *Fables*. The drama was represented by Racine (1639-99), whose tragedies are the crowning glory of the French stage; and by Molière (1639-93), the best comic dramatist the world has ever seen. Under the absolute sway of the Grand Monarque philosophy became orthodox under the guidance of Malebranche (1631-1715), Bossuet (1627-1704), and Fénelon (1656-1715). By the two last-mentioned writers, and by Bourdaloue (1632-1704), Massillon (1663-1742), and the Protestant divines Claude (1618-97) and Saurin (1677-1780), sacred eloquence was carried to a high state of perfection. The more important didactic prose writings of the age are the cynical *Maximes* of La Rochefoucauld (1613-80), the *Caractères* of La Bruyère (1639-99), and the *Lettres* and *Discours* of St. Evremond (1613-703). In the inimitable letters of Madame de Sévigné (1627-96) to her daughter and friends we have a lively and complete picture of the age, the writers of which had generally conformed to the manners, taste, and religion professed by the court. Before we fairly reach the philosophic era we meet with the names of Le Sage (1688-1747), to whom we are indebted for the *chefs d'œuvre* in novel-writing *Gil Blas* and the *Diable Boiteux*; St. Simon (1675-1755), the writer of the *Mémoires* which treat

and complete in historical language what Sévigné began in her easy, gossiping style; Vauvenargues (1715-47), the author of *Maximes* much healthier in tone than those of La Rochefoucauld; the poet Louis Racine (1692-1763), son of the great dramatist, author of a poem now little read, *La Religion*; and the versatile and superficial Fontenelle (1657-1757), dramatist, metaphysician, historian, and man of science. The seventeenth century may be said to be fully represented by one man, François Marie Aronnet de Voltaire (1694-1778). He claims notice as an epic, lyrical, and comic poet, as a tragic and comic dramatist, as a historian, novelist, and philosopher. It cannot be said that he excelled in the highest walks of literature; France could no more boast of a great epic poem after the *Henriade* was written than she could before it; his tragedies are cold and formal, abounding in philosophical disquisitions; his histories are brilliant, but inaccurate. But his fund of common sense, his keen wit, his persistency, and his appreciation of the tendency of the age, made him be looked upon as chief of the republic of letters for more than half a century. The corrupt practices of priests and rulers drove him into conflict with ecclesiasticism and monarchy; yet, compared with some of his disciples, he might be considered a Christian and conservative. His more important works are: *Zaïre*, *Mérope*, *Alzire*, and *Tancrède* (tragedy); *Henriade* (epic); *Dictionnaire Philosophique*; *Charles XII.*, *Siècle de Louis XIV.* (histories); *Candide* (novel), &c. Next to him in immediate influence on the age stands Jean Jacques Rousseau (1712-78), whose fiery eloquence has never been surpassed. His *Discours contre les Sciences et les Arts* was a declaration of war against civilization; his *Origine de l'Inégalité parmi les Hommes*, a violent attack on the existing social order; and his *Contrat social* proclaimed the principles of popular sovereignty and universal suffrage. In his *Emile* he draws a visionary plan of education; his *Nouvelle Héloïse* is a novel in which love and paradox are strangely blended together; while his *Confessions* excite a mingled feeling of sympathy and disgust. These two great men had each their school of disciples, who were the foremost actors in the revolution. Buffon (1707-88) occupied a less agitated sphere, devoting his powerful intellect to the study of nature; his great *Histoire Naturelle* is a monument which time can scarcely injure. Montesquieu (1689-1755), a writer of unusual scope of mind, combining a masculine vigour with great brilliancy of style, commenced his career with his *Lettres Persanes*, a satire on French manners, government, and even religion. Then followed his *Considérations sur la Grandeur et la Décadence des Romains*, a master-piece of historical style; and finally the *Esprit des Loix*, a profound disquisition upon general legislation. Diderot (1713-83), a passionate and incorrect writer, and D'Alembert (1717-83), a great geometrician, founded the *Encyclopédie*, a vast review of human knowledge, often hostile to social order and always to religion. Among the extreme innovators of the time the most notable are Helvetius, D'Holbach, La Mettrie, and Raynal; Condillac, Condorcet, and Mably kept most on the side of moderation. Among the writers of fiction Bernardin de St. Pierre (1787-1814), author of *Paul et Virginie*, and Prévost (1697-1763), author of *Manon Lescaut*, are particularly worthy of mention; while dramatic literature was enriched by the Barbier de Séville and the *Marriage de Figaro* of Beaumarchais (1732-99), and the tragedies of Ducis and Crébillon. The age was not poetical; poetry had degenerated into imitations of foreign descriptive poets, such as Thomson. The most successful writer of this stamp was Delille (1758-1813). André Chénier (1762-94),

the most promising of all, fell beneath the guillotine just after completing his *Jeune Captive*. Neither the revolution nor the first empire was favourable to literature. Some tragedies by Joseph Chénier (1784-1811), founded on the classic models, a few light comedies and novels of little note, are the only representatives of literary activity, until we come upon the names of Châteaubriand (1768-1848) and Madame de Staël (1766-1817). The former, in his *Génie du Christianisme* and his *Martyrs*, and the latter in her *Allemagne*, *Delphine* and *Corinne*, combated the sceptical spirit of the age of Voltaire; and its political creed was attacked, not very successfully, however, by Joseph de Maistre (1754-1821) and De Bonald (1753-1840). A more moderate politician and more philosophical writer on sociology and religion is found in Benjamin Constant (1767-1830). Later on in the nineteenth century the influence of Goethe, Schiller, Shakespeare, Scott, and Byron began to be felt. The Greek dramatists were no longer considered the only nor even the best models; the arbitrary classical rules, the strict observance of the three unities, which cramped the genius of Corneille and Racine, and which latterly reduced the French drama to a state of insipid conventionalism, were boldly set aside. The middle ages and the present time demanded the warmest sympathy and the most earnest study. Such was part of the creed of many of the most gifted of the younger men of letters in France, and a new school, called the *romantic*, sprang up, headed by Victor Hugo (1802-85), who promulgated the new theories in the preface to his drama of Cromwell, and carried them into practice in numerous poems (*Odes et Ballades*, *Orientales*, *Feuilles d'Automne*, *Chants du Brépuscle*, &c.), dramas (Cromwell, *Marion Delorme*, *Ruy Blas*, *Lucrèce Borgia*, *Le Roi s'amuse*, &c.), and novels (*Notre Dame de Paris*, *Les Misérables*, *Les Travailleurs de la Mer*, &c.). The most notable of his associates were Alfred de Vigny (1779-1863), calm, elegant, and somewhat too refined, author of a volume of *Poèmes antiques et modernes*, of a translation of *Othello*, and of a novel, *Cinq Mars*, by which he is best known to English readers; the capricious Alfred de Musset (1810-1857), at once the Ariol and Caliban of modern French literature, equally at home in the domains of poetry, drama, and romance, and whose favourite hero is a French copy of Byron's *Corsair*, *Lara*, or *Don Juan*; Sainte-Beuve (1804-1869), who published several volumes of poetry (*Consolations*, *Pensées d'Août*, &c.), but now chiefly famous for his *Causeries du Lundi* and other works of a literary-historical nature, in which he has proved himself to the satisfaction of numerous authorities the best literary critic France has ever possessed, and Alexandre Dumas the elder, who opened his career with a historical drama, *Henry III.*, which was quickly followed by *Charles VII.*, *Antony*, *Teresa*, &c., but who is best known to the most of English readers by his novels, *Monte Cristo*, *Les Trois Mousquetaires*, *Vingt Ans Après*, &c. A reactionary movement was attempted, led by Ponsard (1814-67) and Emile Augier (1820-89). Casimir Delavigne (1798-1843) has attempted to combine the classic and romantic schools; and Lamartine (1790-1869) is more than half a romanticist by sentiment and style. Béranger (1780-1857), the greatest of French song-writers, may be considered as belonging to neither of the two schools, though he was ranged on the classicist side. The twenty-five volumes of light, sparkling comedies and vaudevilles, by the indefatigable librettist Eugene Scribe, can scarcely be claimed by any of the rival parties. After the heat of the struggle was over, which was chiefly carried on in the region of the drama, the novels of Georges Sand (*Madame Dudevant*, 1804-76) began to attract

attention. Her *Indiana*, *Lélia*, *Jacques*, *André*, *Consuelo*, *La Petite Fadette*, *La Mare au Diable*, &c., have gained her the reputation of possessing the finest style of any writer of the age. Balzac (1799-1850), by several critics considered the greatest of French novelists, lays bare the vices of modern society in his *Eugénie Grandet*, *Le Père Goriot*, *Scènes de la Vie Privée*, &c. Low life in Paris was vividly depicted by Eugène Sue (1804-57) in the *Mystères de Paris*, *Martin l'Enfant trouvé*, &c. The charming and pure tales of *Picciola*, by Saintine (1798-1865), and *Colomba*, by Prosper Mérimée (1798-70), are especially worthy of notice. Equally healthy in tone are the novels of Émile Souvestre (1806-54), and the admirable stories of the two novelists, conjoined in work as in name,—Erkman-Chatrian (1822-99; 1826-90). A new school, styled the realistic, has had among its representatives the younger Dumas (1824-95), novelist and dramatist; Victorien Sardou (b. 1831), dramatist; Octave Feuillet (1812-90), Ernest Feydeau (1821-78); Henri Murger (1822-61), Gustave Flaubert (1821-80), and Edmond About (1828-85). Some of the most delicate of social problems are treated in them with candour, if with little delicacy. Still more recently a group of writers has arisen who have striven to outdo the most realistic of their predecessors in depicting scenes of low life. The chiefs of this school are Émile Zola (born 1840), Alphonse Daudet (1840-97), Émile Gaboriau (1835-73), Adolphe Belot (1829-90), Victor Cherbuliez (1829-99), Paul Bourget (b. 1852), the brothers Edmond and Jules de Goncourt (1822-96; 1830-70), Guy de Maupassant (1850-93), &c. Among recent poets we may mention Théophile Gautier (1811-72), also known as a novelist; Leconte de Lisle (1818-94); Charles Baudelaire (1821-67); Sully-Prudhomme (born 1839); François Coppée (born 1842); Paul Verlaine (1844-96); Anatole France (b. 1844), also a well-known critic; Paul Déroulède (b. 1846); and J. Richepin (b. 1849). Other novelists not mentioned above are the following: Jules Sandeau (1811-83); Theuriet (b. 1833); Jules Claretie (1840), also known as critic and poet; G. Ohnet (b. 1848); Gyp, the *nom de guerre* of Countess de Martel de Jauville (b. 1850); Louis M. J. Viaud, better known as Pierre Loti (b. 1850); and Marcel Prévost (b. 1862). If the preceding century was the philosophic age *par excellence*, the nineteenth may be said to be the historical. The following are the chief writers in other departments and their principal works. Louis Blanc (1818-82), *Histoire de Dix Ans*, *Histoire de la Révolution Française*; Guizot (1787-1874), *Mémoires relatifs à l'Histoire de France*, *Histoire de la Révolution d'Angleterre*; Michaud (1767-1839), *Histoire des Croisades*; Michelet (1791-1874), *Histoire de France*; Mignet (1776-1884), *Histoire de la Révolution Française*; Sismondi (1778-1842), *Républiques Italiennes du Moyen Age*; Amédée Thierry (1787-1878), *Histoire des Gaulois*; Augustin Thierry (1795-1856), *Conquête de l'Angleterre par les Normands*, *Le Tiers État*; Thiers (1797-1877), *Histoire de la Révolution Française*, *Histoire du Consulat et de l'Empire*. Literary historians: J. J. Ampère (1800-64), *Histoire littéraire de France avant le XII^e Siècle*, *Littérature Française au Moyen Age*; Littré (1801-81), *Histoire de la Langue Française*, *Compte et la Philosophie positive*; Sainte Beuve (1804-69), *Causeries du Lundi*, *Portraits Contemporains*; Taine (1828-93), *Histoire de la Littérature Anglaise*, *Les Philosophes Français du XIX^e Siècle*; Vinet (1797-1847), *Blaise Pascal*, *Moralistes des XVI^e et XVII^e Siècles*. Philosophy is represented by Auguste Comte (1798-1857), *Cours de Philosophie positive*; Victor Cousin (1792-1867), *Le Vrai, le Beau, et le Bien*, *Histoire de la Philosophie*; Jouffroy (1796-1842), *Cours*

de Droit Naturel, *Cours d'Esthétique*; Lamennais (1782-1854), *Esquisses d'une Philosophie*; Montalembert (1810-70), *Du Vandalisme et du Catholicisme dans l'Art*; Quinet (1803-75) *Le Génie des Religions*, *Le Christianisme et la Révolution*; Rémusat (1797-1875), *Essais de Philosophie*, *Philosophie Religieuse*; Renan (1823-92), *Histoire des Langues Sémitiques*, *Vie de Jésus*. Among the writers on political economy and sociology are Bastiat (1801-50), Chevalier (1806-79), Prévost Paradol (1829-70), Tocqueville (1805-59), Jules Simon (1814-96), &c. We can simply mention the names of the principal scientific writers:—Étienne Geoffroy St. Hilaire and his son Isidore, Cuvier, Jussieu, in natural science; Gay-Lussac, Bichat, Magendie, in chemistry and medicine; and Lagrange, Laplace, and Arago in mathematics. Writers of travels, &c., are: Burnouf, Champollion, Father Huc, and others. Of essayists and literary and art critics Alphonse Karr, Émile Girardin, Jules Janin, Fétis, Villemessant, Théophile Gautier, and J. Lemaitre are among the best known.

French Architecture.—The earliest specimens of architecture in France belong to the Gallo-Romanic period. The *Maison Carrée*, a Corinthian temple in Nîmes, is one of the best preserved and most interesting structures of that age. It is evident from what is still preserved of the ecclesiastical and other buildings that the forms of Greek art adopted by the Romans were closely imitated; and even up till the eleventh century the construction of all edifices of importance was intrusted to Italian architects trained in the classic schools. Then the Gothic style arose, and carried all before it. The architectural art was cultivated by the ecclesiastics, and many buildings of extraordinary merit owe their origin to some monks, so piously humble that they have left no trace of their names. Some names have, however, come down to us. Fulbert, of Chartres, planned the cathedral of that town, and directed for a time the construction (1020); the abbey church of St. Denis was built from the plans of the minister Suger. The cathedral of Amiens was commenced in 1220 by Robert de Luzarche, and continued by Thomas and Renaud de Cormont. About the middle of the thirteenth century there were three architects of great fame in France,—Jean de Chelles, who built the lateral portico in the south side of the cathedral of Notre-Dame, at Paris; Pierre de Montreuil, who planned the old Holy Chapel of Vincennes; and Eudes de Montreuil, to whom Paris was indebted for several imposing churches now destroyed. Covey and La Bergier rebuilt the ancient cathedral at Reims, which had been destroyed by a fire. Jean Ravy, sculptor and architect, employed his double talent to complete the cathedral of Notre-Dame (1351). The Gothic style began to lose ground about the end of the fifteenth century; and under the influence of the southern artists introduced into France by Francis I. Italian architecture obtained firm footing. The most celebrated French architects of that period were Lescot, Delorme, and Jean Bullant. Under the regency of Marie de Medici flourished Desbrosses, who planned the Luxembourg Palace. The age of Louis XIV. was favourable to this *s.t.*, and we meet with notable names—Perrault, Bruant and Mansard, who built the *Hôtel des Invalides*. The Palace of Versailles is the work of Mansard alone. The principal architects of the eighteenth century are—Gabriel, who designed the square known as the Place de la Concorde; Oppenow, who designed the greater part of the *Palais Royal*; G. de Boffrand, De Wailly, Lemaire, D'Ivry, Soufflot, the architect of the Panthéon and the *École de Droit*; Antoine, Moreau, Descoutures, and Desmazières, the joint authors of the *Palais de Justice*; Rousseau

who planned the Palace of the Legion of Honour, now burned down; Louis, who built the Théâtre Français; Chalgrin, whose chief work is the Collège de France, &c. Under the first empire the Bourse was erected by Brongniart, the Madeleine by Vignon and Huvé, the Arc de Triomphe du Carrousel and one of the wings of the Louvre by Fontaine and Percier, the Corps Législatif by Poyet. Among the recent architects of most note are Garnier, who erected the new Opera House; Visconti, who completed the Louvre; Baltard who planned the Halles; Lefuel, who reconstructed the Tuileries; Espérandieu, Viollet-le-Duc, Gau, Blouet, Duc, the architect of the façade of Palais de Justice, &c.

French School of Painting.—France, in the reign of Charlemagne, and subsequently, had numerous miniature and enamel painters, but can be hardly said to have had a school of painting of its own until the sixteenth century. With the exception of the Clouets (father, son, and grandson) and Jean Cousin, who owed little to foreign masters, the older French painters either studied in Italy or were mere imitators of Italian painters, while many Italians were either temporary or permanent residents in France. Among these were Leonardo da Vinci, Andrea del Sarto, Rosso, and Primaticcio, all of whom were invited by Francis I. The influence of Rosso and Primaticcio was considerable. Commissioned to decorate the Palace of Fontainebleau, they employed many Italian and French artists as assistants, on whom they imposed their ideas, manner, and style, and this created a distinct school known as that of Fontainebleau. An independent French style was formed by Simon Vouet (1582–1641), who was regarded as the master and model of the succeeding generation of French artists. Nicolas Poussin (1594–1665), stamped a character on the art of his country which may be said to have lasted almost to our own days. Claude Lorraine (1600–82), better known as Claude Lorrain, is of all landscape-painters the one best able to express the poetry of nature. The most celebrated of Vouet's disciples were Eustache Lesueur (1617–55), and Charles Lebrun (1619–90), court painter to Louis XIV., and one of the founders of the Academy of Painting and Sculpture at Paris, and the French Academy at Rome. Pierre Mignard (1610–95), another pupil in the same school, was justly esteemed for the nobleness of his style and the delicate grace of his execution. The *fêtes galantes* of the nobility under the regency of Philippe d'Orléans were represented with piquant grace by Antoine Watteau (1684–1721). His exquisite finish, the poetic charm with which he transferred to his canvas the follies of the regency, have gained for him a fame which suffers somewhat from the attack of the higher critics, who charge him and his imitators with having degraded French art to its lowest pitch. In opposition to this school rose another, inspired with purer and healthier ideals:—Pierre and Vien, historical painters; Chardin; and greater than all, J. B. Greuze (1725–1805), who represented the scenes of everyday life; and Vernet, painter of landscape and sea pieces. It

was, however, painfully evident that art was steadily deteriorating. It owes its resuscitation to the mental excitement of the revolution; but the form which it assumed was due to the genius and energy of Jacques Louis David (1748–1825), who tried to inculcate elevated sentiments on his disciples, and gain the sympathy of the French school for what was truly noble, grand, and heroic. Among the most distinguished of his pupils are Gérard, Gros, Drouais, Granet, and Ingres. A reaction against this classic school, as it was called, was headed by Géricault, Delacroix, Delaroche, Scheffer, Vernet, and Descamps. Among the eminent French contemporary artists we may mention Rosa Bonheur, an animal painter; Courbet, the leader of a new school called the realistic; Gustave Doré, Cabanel, Yvon, Bin, historical painters; Gérôme, Comte, Hector Leroux, G. Boulanger, Lévy, Bréton, Millet, Hébert, as genre painters, Corot, D'Aubigny, André, Noël, and Barry as landscape and marine painters; and Chaplin, Henner, Mademoiselle Jacquemart, and Henriette Browne, as portraitists.

French Sculpture.—The first essays of the French sculptors were little else than imitations of the Byzantine school, and later of the Italian. It was not until Jean Goujon (1515–72) had produced his Diana that France could boast of an original sculptor. His most remarkable work is the Fontaine des Innocents at Paris. Germain Pilou (1518–90), Jean Cousin (about 1500–90), and Barthélemy Prieur (died 1611) were the ablest of his contemporaries. Jean de Bologne (1524–1608), though a Frenchman by birth, may be looked upon as an Italian from his long residence in Italy and his training under Michael Angelo. François Anguier (1604–69) executed the beautiful tomb of the Duke of Montmorency in the church of St. Mary at Moulins, and along with his brother Michel the statues and reliefs of the Porte St. Denis. Girardon (1628–1715), pupil of the former, was the favourite sculptor of Louis XIV., and executed a great number of statues for Versailles, Trianon, and other royal residences. A much superior artist, however, was Pierre Puget (1622–94), who, unassisted by any master, gained for himself deservedly the title of the French Michael Angelo. He is undoubtedly one of the greatest sculptors of modern times. The art was practised with more or less success down to the 18th century by Pierre Legros, the brothers Coustou, Bouchardon, L. Adam Lemoyne, Bosio, Stouf, and Pigalle. The revolution which took place in painting under the influence of David extended itself to sculpture, but the new school which arose, in their zeal for reform, soon fell into conventionality and affectation. The downward progress of the art was, however, arrested by David of Angers (1789–1856), Pradier (1792–1852), and Rude (1784–1858). Among the more distinguished of modern French sculptors may be mentioned Barye, Ramey, Jouffroy, Perraud, Carpeaux, Cain, Guillaume, Gruyère, Leharivel-Durocher, Dubois, Falguier, Aizelin, Chapu, &c.

For an account of the Roman Catholic Church in France see GALLICAN CHURCH.

SUPPLEMENT.

DRAKENBERG, or **KWATHLAMBA MOUNTAINS**, an important mountain-system in South Africa, beginning with the Zuurberg and Stormberg ranges in the north-east of Cape Colony and extending in a north-easterly direction as far north as the Olifant river in the Transvaal. The most southerly portion, from the eastern extremity of the Stormberg to the Mont aux Sources, forms the boundary between Basutoland and Natal, and is generally known by the name Kwathlamba. From the Mont aux Sources northwards the range is known as the Northern Drakenberg, or the Drakenberg simply, this name being given especially to that part which separates Natal from the Orange River Colony. North of the neighbourhood of Majuba the range is entirely in the Transvaal, and even north of the Olifant river it is represented by the detached Zoutpansberg and other ranges. From the Drakenberg Mountains to the Indian Ocean the land descends in a series of terraces, but towards the west the slope is more gradual. Mont aux Sources, at the point of meeting of Natal, Basutoland, and the Orange River Colony, forms the centre of the system, and in its neighbourhood several subsidiary ranges, such as the Maluti Mountains of Basutoland and the Roodeberg of the Orange River Colony, have their origin. The height of Mont aux Sources above sea-level is 10,000 feet; but there are higher peaks in the range, such as Champagne or Cathkin Castle (10,520) to the south-east. Giant's Castle, still farther south, is about 11,000 feet high, and other peaks are Tintwa (7500), about due west of Ladysmith, Mount Melanie, farther north, and Majuba (7000), near the northern extremity of Natal. Mauchberg (8730) is the highest peak of the Transvaal. The Drakenberg range is crossed by several passes, such as Van Reenen's Pass, through which the railway from Ladysmith to Harrismith passes; De Beers Pass, a little to the north-east; and Botha's Pass, in the far north of Natal. The Drakenberg forms the water-parting between the rivers flowing to the Indian Ocean and those flowing west to the Orange. The Tugela rises in Mont aux Sources.

DRAPER, **JOHN WILLIAM**, chemist and physiologist, was born at St. Helen's, Lancashire, on May 5, 1811. After receiving a training in science, partly under a private teacher and partly at University College, London, he went to America in 1833, where he graduated in 1836 M.D. of Pennsylvania University. Afterwards he became successively professor of physical science in Hampden-Sidney College, Virginia (1836-39), and of natural history, chemistry, and physiology in the University of New York (1839-73). He made many contributions to scientific literature, and devoted much attention to the chemical action of light, in connection with which he effected some discoveries. Among his chief works are his *History of the Intellectual Development of Europe* (1862) and his *History of*

the Conflict between Science and Religion (1874), works which have been translated into several languages. He also wrote a *History of the American Civil War* (1867-70) and some scientific treatises, including *Scientific Memoirs* (1878) and text-books of chemistry and human physiology. He died after a brief retirement, at Hastings, near New York, on Jan. 4, 1882.—His son, **HENRY DRAPER** (born 1837, died 1882), chemist and astronomer, made some valuable researches on the spectra of the heavenly bodies.

DRAPIER'S LETTERS. See **SWIFT**, **JONATHAN**.

DRAVIDIAN, a term applied to the vernacular tongues of the great majority of the inhabitants of Southern India, and to the people themselves who must have inhabited India previous to the advent of the Aryans. The Dravidian languages are generally considered to belong to the Turanian class, and the family consists of the Tamil, Telugu, Canarese, Malayalam, Tulu, Tuda, Gond, Rajmahal, Oraon, &c. Only the first four mentioned have a literature, that of the Tamil being the oldest and the most important. The chief work on these languages is Bishop Caldwell's *Comparative Grammar of the Dravidian Languages* (1856, 2nd. ed. 1875).

DREISSENA, or **DREISENNIA**, a genus of fresh-water lamellibranchiate molluscs allied to the mussels. One species (*D. polymorpha*) is a native of the streams which flow into the Caspian, but has been accidentally introduced into most rivers and estuaries of Europe, including those of Britain, where it is now abundant.

DRELINCOURT, **CHARLES**, a French Calvinistic minister, was born at Sedan in 1595, and died at Paris in 1669. He was the author of many controversial works, and of a book entitled *Les Consolations de l'Âme Fidèle contre les Frayeurs de la Mort*, which was translated into English under the title, *The Christian's Defence against the Fear of Death* (1675). To promote the sale of the English translation of this work, De Foe, it is said, wrote his *Apparition of Mrs. Veal*, which was published along with the fourth edition of it in 1706.—His son **CHARLES** (1633-39) became professor of medicine and anatomy at Leyden, and was appointed physician to William, Prince of Orange, afterwards William III. of England; while another son, **PETER** (1641-1704), became chaplain to the Duke of Ormonde, and Lieutenant of Ireland, and subsequently Lord of Armagh from 1691 till his death.

DREYFUS, **ALFRED**, for some time captain of artillery and general staff-officer in the French army, member of a rich Jewish family of Alsace. On Oct. 12, 1894, he was arrested on a charge of communicating certain important military documents to a foreign government, and at a secret court-martial, which met on Dec. 19 and succeeded

ing days, he was found guilty and condemned to public degradation and lifelong imprisonment. He was degraded on Jan. 5, 1895, and in accordance with an act passed by the chambers was sent to the *Île du Diable* (Devil's Island), near Cayenne, to undergo the other part of the sentence. On June 1 of the same year Colonel Picquart became head of the Intelligence Department of the army, and in the course of his official duties discovered various circumstances which threw doubt on the correctness of the court-martial's decision, and pointed to another officer, of the name of Esterhazy, as the real traitor; and in particular he obtained a copy of a telegram-card, subsequently known as the *petit bleu*, alleged to have been addressed to Esterhazy by a German officer, Colonel von Schwarzkoppen. On Sept. 7, 1896, he wrote to General Gonse urging a reinvestigation of the case, and seven days later a newspaper divulged the fact that certain documents had been communicated to the court-martial unknown to the prisoner's counsel. Not long afterwards a facsimile of the *bordereau* (memorandum, detailed list of documents), which was alleged to have been written by Dreyfus and largely contributed to his condemnation, was published in another newspaper, and on Nov. 16 Colonel Picquart was superseded in his office by Colonel Henry. On Nov. 15, 1897, M. Mathieu Dreyfus, brother of the condemned man, charged Esterhazy with having written the *bordereau*, but on Jan. 11, 1898, he was acquitted by a court-martial which sat with closed doors. On the following day Colonel Picquart, who had been sent to Tunis after his dismissal from office, and had been afterwards recalled to answer certain charges made by Esterhazy, was arrested and imprisoned. On Jan. 13 M. Zola, the eminent novelist, published in the *Aurore* a letter headed *J'accuse* (I accuse), in which he made serious charges against the general staff and the government in regard to the Esterhazy court-martial. After a stormy debate in the chambers it was decided to prosecute him; but the government steadily refused to reopen the Dreyfus case, declaring their determination to stand by the *chose jugée*. Zola's trial began on Feb. 11, and on the 23rd he was condemned to pay a heavy fine and to undergo a term of imprisonment. On April 2 the Court of Cassation quashed the sentence on Zola on technical grounds, but a fresh prosecution was ordered a few days later. On June 27 M. Brisson succeeded M. Méline as premier, and M. Cavaignac became head of the war office. On July 7 M. Cavaignac read to the chamber several documents which he regarded as proving the guilt of Dreyfus, but three days later Colonel Picquart wrote to the premier denouncing these documents as forgeries. This interference led to his rearrest, and shortly after Zola was again condemned. On Aug. 31 Colonel Henry was arrested, and confessed to having forged the chief document relied on by Cavaignac, but soon after his arrest he committed suicide. The war minister resigned on Sept. 4, and was succeeded by General Zurlinden. The latter resigned because of the government's determination to refer the question of revision to a commission, and on Sept. 18 General Chanoine succeeded him. The commission decided against revision, and on Sept. 26 the government resolved to ascertain the view of the Court of Cassation. On Oct. 25 the Brisson ministry resigned, and a few days later the court reported in favour of revision. On Oct. 31 a new ministry under M. Dupuy came into office, and on Dec. 9 the prosecution of Picquart was stopped by the Court of Cassation. On Feb. 16, 1899, M. Felix Faure, the president of the republic, died suddenly, and three days later he was succeeded

by M. Émile Loubet. On June 8 of the same year the Court of Cassation, having concluded its hearing of the evidence, ordered a fresh court-martial to be held at Rennes for the purpose of deciding whether Dreyfus communicated to a foreign government any of the documents mentioned in the *bordereau*, of which Esterhazy had previously confessed himself to be the author. Picquart was released on June 9, and on the 12th of the same month the ministry was defeated. On June 22 M. Waldeck-Rousseau succeeded in forming a somewhat heterogeneous ministry, which included General de Gallifet as minister of war and M. Millerand, a socialist, as minister of commerce. The new court-martial opened on Aug. 7 under the presidency of Colonel Jouaust, and about this time the press published accounts of the inhuman treatment of Dreyfus in his prison. Dreyfus, who had been brought to Rennes for trial, was defended by MM. Demange and Labori. The chief witnesses in favour of the prisoner were Colonel Picquart and Captain Freytag, a member of the first court-martial, and against him were the Generals Mercier, Gonse, Roget, de Boisdaffre, and Billot. An attempt to kill M. Labori on his way to court on Aug. 14 was fortunately unsuccessful. On Sept. 8 M. Demange delivered a brilliant speech on behalf of the prisoner, but on the following day the judges, by five votes to two, declared the prisoner guilty, with extenuating circumstances. This verdict was so flagrantly opposed to the published evidence (this court-martial held most of its sittings in public) that it was received with indignation and contempt throughout almost the whole civilized world. Dreyfus was sentenced to ten years' imprisonment in a fortress, but a subsequent full pardon from President Loubet set him at liberty. Several times during the progress of the case France seemed on the verge of revolution, and anti-Semitic fanaticism and insane glorification of the army proceeded to almost incredible lengths. The case lasted during the tenure of office of six ministries (Dupuy, Ribot, Méline, Brisson, Dupuy, Waldeck-Rousseau), and it formed a subject of official consideration for three presidents (Casimir-Perier, Faure, Loubet) and nine ministers of war (Mercier, Zurlinden, Billot, Cavaignac, Zurlinden, Chanoine, de Freycinet, Krautz, Gallifet).

DRIET, in geology, a term applied to earth and rocks which have been conveyed by glaciers or land-ice (perhaps also by icebergs) and deposited over the surface of a country, as, for instance, during the glacial period of Northern Europe: also designated *Boulder Clay*. See **GEOLOGY**.

DRIVER, REV. SAMUEL ROLLER, D.D., Litt.D., professor of Hebrew and Biblical critic, was born at Southampton on Oct. 2, 1846. He studied at Winchester College and at New College, Oxford, where he graduated with first-class honours in classics in 1869. In 1866 he gained the Pusey and Ellerton Hebrew Scholarship, in 1870 the Kenniott Hebrew Scholarship, besides prizes for Septuagint Greek and Syriac. He was for some years a fellow and tutor of his college, and from 1876 till 1884 he was a member of the Old Testament Revision Company. In 1883, on the death of Professor Pusey, he was appointed to the Regius Professorship of Hebrew at Oxford, at the same time becoming Canon of Christ Church. Of his numerous works we may mention: *A Treatise on the Use of the Tenses in Hebrew*, &c. (1874, 3rd ed. 1892); *Isaiah: his Life and Times*, and the *Writings which bear his Name* (1888, 2nd ed. 1893); *Notes on the Hebrew Text of the Books of Samuel*, with *Introduction on Hebrew Paleography* (1890); *Introduction to the Literature of the Old Testament* (1891), a work aimed for popu-

lar reading, which has passed through a number of editions; Sermons on Subjects connected with the Old Testament (1892); the Book of Leviticus (1894-98) in The Polychrome Bible, along with H. A. White; and a Commentary on Deuteronomy (1895). He was one of the editors of the Variorum Bible, with various renderings and readings and valuable other aids to the study of the Scriptures, published by Messrs. Eyre and Spottiswoode in 1880; and along with Dr. Neubauer he translated a series of Jewish commentaries on the 58th chapter of Isaiah. He is also joint-editor of the Hebrew-English Lexicon of the Old Testament, now in course of publication, his fellow-editors being Professors Briggs and F. Brown.

DROPPWORT (from the small tubers on the fibrous roots), *Spirea filpendula*, belonging to the natural order Rosaceae, a British plant of the same genus as queen-of-the-meadow, found in dry pastures. It has pinnate leaves with serrated segments, and in habit resembles the meadow-sweet, from which it may be distinguished, however, by its scentless flowers and its different habitat. The hemlock dropwort, or water dropwort, is (*Eranthe fistulosa*, an umbellifer with decoumpound leaves, growing near or in water. It is said to be poisonous.

DRUMMOND, PROFESSOR HENRY, was born near Stirling on Aug. 17, 1851, his father, Henry Drummond, J.P., being member of a family distinguished for zeal in the cause of evangelical religion. He was educated at the universities of Edinburgh and Tübingen, and also studied at New College, Edinburgh, one of the theological colleges of the Free Church of Scotland. He entered the ministry of the Free Church, and having devoted much attention to science, he was in 1877 appointed lecturer on natural science in the Free Church (theological) College, Glasgow, being made professor in 1884. In 1878 he accompanied Sir Archibald Geikie in a geological tour in the Rocky Mountains; in 1884-85 he carried out a journey of exploration in Central Africa; and he also visited the Malay Archipelago, the New Hebrides, China, and Japan. One of his most popular books was *Tropical Africa* (1888), giving his own experiences in that part of the world. His most remarkable work, and the one by which his name became most widely known, is *Natural Law in the Spiritual World* (1883), which has passed through many editions and been translated into various languages. This work was written with the object of showing that such scientific doctrines and theories as those associated with the name of Darwin and his followers were not incompatible with revealed religion. He is author also of *Travel Sketches in our New Protectorate* (1890); *The Greatest Thing in the World*; *The Ascent of Man* (1894), &c. The last-named work is a semi-popular review of evolution theories which caused some controversy on its first appearance, mainly on account of its author's insistence on the recognition of altruism, or 'the struggle for the life of others', as the most important factor in organic and especially in social evolution. Professor Drummond's health latterly gave way, and he sought in vain to restore it by travelling on the Continent. He died at Tunbridge Wells on March 11, 1897. He was a man of fine character and attractive personality, and his facile and fervid style of composition suited the tastes of large numbers of readers. See the *Life* by G. A. Smith (1898).

DRUMMOND, REV. JAMES, theologian, was born at Dublin on May 14, 1835, and received his early education at a private school. At the age of sixteen he entered Trinity College, Dublin, where in 1855 he graduated B.A. and obtained the first gold

medal in classics. In 1859 he became colleague of the Rev. William Gaskell in Cross Street Chapel, Manchester, a position which he occupied till his appointment in 1869 as Professor of Theology at Manchester New College, London; and since 1885 he has been Principal of that institution, which is now known simply as Manchester College, and since 1889 has been established at Oxford. On his removal to Oxford he obtained the degree of M.A. at that university; and he also holds the degrees of LL.D. and Litt.D. His works include *Spiritual Religion: Sermons on Christian Faith and Life* (1870); *The Jewish Messiah: a Critical History of the Messianic idea among the Jews* (1877); *Introduction to the Study of Theology* (1884); *Philo-Judaism: or the Jewish-Alexandrian Philosophy in its Development and Completion* (2 vols., 1888); *Via, Veritas, Vita* (Hibbert Lectures for 1894 on Christianity); and *The Pauline Benediction* (1897).

DRUMMOND LIGHT, a very intense light produced by turning two streams of gas, one of oxygen and the other of hydrogen, in a state of ignition upon a ball or cylinder of lime, hence the name *limelight*. This light is named after Captain Drummond (see DRUMMOND, THOMAS). See OXY-HYDROGEN LIGHT in SUPP.

DRUNKARDS, HABITUAL. The *Habitual Drunkards Act* of 1879 provided for the licensing of retreats for receiving habitual drunkards, and for the regular inspection of such retreats. A habitual drunkard desiring admission to a retreat had to make a written application, accompanied by a declaration of two persons that the applicant was a habitual drunkard, and attested by two justices of the peace. No patient in a retreat was permitted to leave before the expiration of the term stated in the application, such term not to exceed one year. This act was to expire in ten years; but another act, passed in 1888, made it permanent, with some modifications. The *Inebriates Act* of 1898 introduced several important changes. It transferred the licensing power in counties from justices of the peace to county councils and their committees, and in boroughs from magistrates to town councillors or police commissioners. The maximum period of detention was extended to two years, and the attestation of one justice was made sufficient for a valid application. It also gave power to the Secretary of State to establish state inebriate reformatories, or to grant certificates to reformatories suitable for such a purpose. If a habitual drunkard, when drunk, commit an offence punishable by imprisonment or penal servitude, the court may, in addition to, or substitution of, the ordinary sentence, order him to be detained three years in a state or certified inebriate reformatory. The proof that the accused is a habitual drunkard may consist either in his own admission or in the jury's verdict after inquiry. The *Inebriates Act* of 1890 was a very short act, and made no important change in the law as above stated.

DRYING-MACHINE, a machine used in bleaching, dyeing, and laundry establishments, consisting of two concentric drums or cylinders, one inside the other, open at the top, and having the inner cylinder perforated at its side with numerous small holes. The goods to be dried are placed within the inner cylinder, and the machine is then made to rotate with great velocity, when, by the action of centrifugal force, the water escapes through the holes in the side. The action of the drying-machine is the same in principle as that witnessed when a person tumbles a mop to dry it.

DUBITZA, a fortified town of Bosnia, on the right bank of the Unna, about 10 miles from the

confluence with the Save. In the sixteenth and seventeenth centuries it was a frequent point of contention between Austria and Turkey. In 1878, with the rest of Bosnia, it passed under Austrian administration. Pop. 3000.—On the opposite bank of the Unna, in Croatia, stands Austrian Dubitz, with upwards of 6000 inhabitants.

DU BOIS-REYMOND, EMIL, German physiologist, and an especial authority on animal electricity, was born at Berlin on Nov. 7, 1818. He studied theology, geology, and latterly anatomy and physiology at Berlin under Johann Müller, whom he succeeded as professor of physiology in the University of Berlin in 1858. In 1867 he became permanent secretary of the Berlin Academy of Sciences. His principal publication is *Researches in Animal Electricity* (1848-54); but he published several other technical works, and also some lectures, of which the chief is entitled *Ueber die Grenzen des Naturerkennens*. He died at Berlin on Dec. 26, 1896.

DUBOVKA, a town of South Russia, in the government of Saratov, on the Volga. It has an extensive river trade in wool, iron, oil, grain, &c. Pop. (1894), 16,853.

DU CHAILLU, PAUL BELLONI, traveller, was born in Paris on July 31, 1835. He spent his youth in the French settlement on the Gaboon, on the west coast of Africa, where his father was a merchant, and received his education from the Jesuits there. In 1852 he went to the United States, of which he afterwards became a naturalized citizen. In 1855 he began his first journey through Western Africa, and spent till 1859 alone among the different tribes, travelling on foot upwards of 8000 miles. He collected several gorillas, never before hunted, and rarely, if ever, before seen by any European. The result of this journey was his work *Explorations and Adventures in Equatorial Africa*, published in 1861. This book contained much important information on the zoology, geography, and ethnology of parts of the continent then unknown to Europeans, and by many authorities Du Chaillu's statements were received with suspicion; but subsequent expeditions by others fully confirmed his substantial accuracy. A second expedition was made by him in 1863, an account of which, under the title *A Journey to Ashango Land*, appeared in 1867. The *Land of the Midnight Sun*, an account of a tour in Northern Europe (1881), had a considerable success. He has also published a number of books intended for youth, and based on his travels. One of his later works is the *Viking Age* (1889), a treatise on the ancestors of the English-speaking peoples. In addition to the works named above, we may mention his *Stories of the Gorilla Country* (1868), *Wild Life under the Equator* (1869), *Lost in the Jungle* (1869), and *The Country of the Dwarfs* (1872). Many of his specimens are now in the British Museum.

DUFF, ALEXANDER, Scottish missionary, was born in Perthshire on April 26, 1806. He studied at St. Andrews University, where he was powerfully influenced by Thomas Chalmers, then Professor of Moral Philosophy. On the completion of his course he set out in 1829 for India as the first Church of Scotland missionary to that country. On the way he was twice shipwrecked and lost nearly all his effects, but he ultimately arrived in Calcutta in 1830. He opened a school there in which he sought to teach not only the doctrines of Christianity, but also the English language and the science and learning of Europe. His school prospered in spite of opposition, but on his secession from the Church of Scotland at the Disruption of 1843 he had to surrender the whole of its buildings and accessories

and begin again. He assisted in founding the University of Calcutta, and was urged to accept the vice-chancellorship in 1863, but his health at that time compelled him to return home. He continued, however, to work for the foreign missions of the Free Church, and raised £10,000 to endow a missionary chair in the New College, Edinburgh, becoming himself its first occupant. He died at Edinburgh on Feb. 12, 1878. His chief writings are: *The Church of Scotland's India Mission* (1835); *Vindication of the Church of Scotland's India Mission* (1837); *India and India Missions* (1840); *The Ganges* (1845); and *The Indian Mutiny: Its Causes and Results* (a series of letters published in 1858).

DUFF, SIR MOUNTSTUART ELPHINSTONE GRANT, writer on political and other subjects, was born in Aberdeen on Feb. 21, 1829, his father being J. C. Grant-Duff of Eden, author of a History of the Mahrattas and friend of Mountstuart Elphinstone, the Indian administrator. He received his earlier education at Edinburgh Academy and The Grange, Bishop-Wearmouth, and afterwards studied at Balliol College, Oxford, graduating B.A. in 1850 and M.A. three years later. He was called to the Bar at the Inner Temple in 1854, and in 1857 he entered the House of Commons as Liberal member for the Elgin Burghs, a constituency which he continued to represent till 1881. From 1868 till 1874 he held the office of Under-Secretary for India under Mr. Gladstone, and again in that statesman's second ministry he was Under-Secretary for the Colonies from 1880 till his appointment in 1881 as Governor of Madras. His tenure of this important office was very successful, and ended with his resignation in 1886. From 1889 till 1893 he was President of the Royal Geographical Society. He was made a privy counsellor in 1880, and G.C.S.I. in 1886. His published works include *Studies in European Politics* (1866); *A Political Survey* (1868); *Elgin Speeches* (1871); *Notes of an Indian Journey* (1876); *Miscellanies, Political and Literary* (1879); *Memoir of Sir Henry Sumner Maine* (1892); *Ernest Renan* (1893); and *Notes from a Diary* (1897-98-99-1900-01).

DUFFERIN, FRIMMERICK TEMPLE HAMILTON-BLACKWOOD, MARQUIS OF, British statesman and author, son of the fourth Baron Dufferin by a granddaughter of R. B. Sheridan, was born at Florence on June 21, 1826. He was educated at Eton and Christ Church, Oxford, and succeeded to his father's title in 1841. He began his public services in 1855, when he was attached to Earl Russell's mission to Vienna. Subsequently he was sent as commissioner to Syria in connection with the massacre of the Christians (1860), being created K.C.B. on his return. From 1864 till 1866 he was Under-Secretary for India, and for a short period in 1866 he acted in a similar capacity at the war office. He held the chancellorship of the Duchy of Lancaster under Mr. Gladstone from 1868 till his appointment in 1872 as governor-general of Canada, having been created Earl of Dufferin in 1871. He showed great ability as an administrator during his six years of office. He was English ambassador at St. Petersburg (1879-81) and at Constantinople (1882). From 1882 to 1888 he was engaged in arranging the affairs of Egypt after Arabi's defeat, a task in which he met with great success; and in 1884 he went to India as viceroy in succession to the Marquis of Ripon. During his tenure of this office, which expired in 1888, Upper Burma was annexed (1885). In 1888 he was made Marquis of Dufferin and Ava. Lord Dufferin has also been ambassador at Rome (1869-91) and at Paris (1891-96). In 1847 he published *Narrative of a Journey from Oxford to Skibbereen during the*

year of the Irish Famine; in 1860, Letters from High Latitudes, the story of a yachting voyage to Iceland; and he also issued various pamphlets on Irish questions. A volume of speeches was issued in 1882, and another of speeches in India in 1890. He died at Olandeboyne, Down, on Feb. 12, 1902. His wife (married 1862) has published Viceroyal Life in India (1889) and My Canadian Journal (1891).

DUFFY, SIR CHARLES GAVAN, statesman, was born in Monaghan, Ireland, on April 12, 1816, and educated at Monaghan Public School and Belfast Institution. He took to journalism, and in 1842 assisted in founding a Dublin newspaper called the Nation. In 1843 he was convicted of sedition along with O'Connell, but the House of Lords in the following year quashed the conviction. He played a prominent part in the founding and directing of the Irish Confederation, and in 1848 he was brought to trial along with other members of that body on a charge of treason-felony, but the prosecution could not obtain a conviction. In 1852 he was elected to parliament as representative of New Ross, and succeeded in forming an independent Irish political party. Dissensions arose, however, within this body, and in consequence Mr. Duffy resigned his seat and went to Australia in 1856. For some time he practised as a barrister in Melbourne. In 1857 he became Minister of Public Works in the first responsible Victorian government. In 1858, and again in 1862, he was Minister of Lands, and after a two-years' visit to Europe he became Premier of Victoria in 1871. Having again visited the home country, he was made K.C.M.G. in 1873, and on his return to Australia he was elected in 1877 Speaker of the Victorian Legislative Assembly. Three years afterwards he finally returned to Europe. Several works from his pen have been published, including The Ballad Poetry of Ireland (1845, about 50 editions), originally published in the Nation; Young Ireland: a Fragment of Irish History, 1840-50 (1880); Four Years of Irish History, 1845-49 (1883), a sequel to the preceding work; Bird's-Eye View of Irish History (1882); The League of North and South (1886); Thomas Davis (1890); Conversations with Carlyle (1892); and My Life in Two Hemispheres (2 vols., 1898).

DUMAS, JEAN-BAPTISTE-ANDRÉ, French chemist and politician, was born at Alais on July 14, 1800, and died at Cannes on April 10, 1884. He studied at Geneva, became a lecturer in the École Polytechnique at Paris, and ultimately he was appointed professor of chemistry at the Sorbonne. His researches in various departments of chemical science, especially in the classification of the elements and in the examination of the ethers and other organic bodies, gained him a place amongst the greatest chemists of his time. A memoir entitled Remarques sur quelques Points de la Théorie Atomique brought him much into notice, and his views on the theory of substitution led to some controversy. In 1849 he was elected to the Legislative Assembly by the department of the Nord, and two years afterwards he became Minister of Agriculture and Commerce. Elected member of the Institute in 1832, he became perpetual secretary in 1868, and some years later he was elected a member of the Academy. Besides papers in technical journals, he wrote Traité de Chimie appliquée aux Arts (8 vols.); Cours de Philosophie chimique (1837); and Essai sur la Statique des Êtres Organisés (1841), the last named in collaboration with Bous-singault.

DU MAURIER, GEORGE LOUIS PALMELLA BURNESON, artist, caricaturist, and novelist, was born in Paris on March 6, 1834. He belonged to an old French family which had been driven to England by

the Revolution, and was a naturalized British subject. He spent some years in France and Belgium, and afterwards went to school in London. He at first determined on a scientific career, and studied chemistry at University College, but soon adopted art as a profession, working as a student in the galleries of the British Museum. Then, returning to Paris, he entered the studio of Gleyre, and next went to Antwerp to continue his artistic training. Returning to London, he began to draw on wood for Once a Week, the Cornhill Magazine, &c., and also exhibited at the Royal Academy. He subsequently joined the Punch staff, and became famous through his weekly drawings to that publication. He also illustrated a large number of books, including Thackeray's Esmond and Ballads. A collection of his Punch woodcuts was published in 1880 under the title, English Society at Home. In 1891 appeared his first novel, Peter Ibbetson, and in 1894 he issued Tribby, a story which had a great popularity both in book form and on the stage. An incomplete novel by him was published posthumously as The Martian. His novels can hardly be looked upon as very serious contributions to literature, but his Punch drawings will no doubt have a permanent value as portraying many of the peculiarities of contemporary society. He died on Oct. 8, 1896.

DUMB-CANE, a plant of the order *Araceæ*, the *Dieffenbachia seguina*, of the West Indies, so called from its acidity causing swelling of the tongue when chewed, and destroying the power of speech.

DUMBNESS. See DEAF AND DUMB, APOPHIA, APHASIA.

DUNAMÜNDE, now officially known as USTJ-DVINSK, a fortress and port of Russia on the Gulf of Riga, at the mouth of the Düna, having a large winter harbour for the shipping of Riga. Pop. 2500.

DUNDEE, JOHN GRAHAM OF CLAVEHOUSE, VISCOUNT. See GRAHAM.

DUNKERS, or TUNKERS, a religious sect in America, founded by Conrad Peyssel, a German, in 1724, and which takes its name from the German *tunken*, to dip, from their mode of baptizing converts. They reject infant baptism; use great plainness of dress and language; refuse to take oaths or to fight; and anoint the sick with oil in order to their recovery, depending on this unction and prayer, and rejecting the use of medicine. Every brother is allowed to speak in the congregation, and their best speaker is usually set apart as their minister. They are called also *Dippers*, but by themselves *Bræthren*.

DUNKIN, EDWIN, astronomer, was born at Truro on Aug. 19, 1821. He was educated at private schools, and in 1838 joined the staff of the Royal Observatory at Greenwich. In 1856 he was promoted to the grade of first assistant, becoming in 1881 chief assistant, a post which he resigned in 1884. During his period of service Mr. Dunkin represented the Astronomer-Royal in many important expeditions. He was at Christiania in 1861, being sent to observe the total eclipse of that year; and he was deputed by the Astronomer-Royal to take charge of parties sent to determine the longitude of Brussels in 1853, and of Paris in 1854. In the latter year he also had charge of the pendulum experiments in a coal-pit near South Shields, undertaken in order to determine the mean density of the earth. In 1845 he was elected a Fellow of the Royal Astronomical Society, and in 1876 of the Royal Society. From 1854 till 1886 he acted as president of the former body. He published several works, of which we may mention: On the Movement of the Solar System in Space determined from the Proper Motions of 1167 Stars (1863); On the

Probable Error of Transit Observations (1860-64); The Midnight Sky: Familiar Notes on the Stars and Planets (1869); Obituary Notices of Astronomers (1879); and many papers in scientific journals. He died on Nov. 26, 1898.

DUNQUERQUE. See **DUNKIRK**.

DURBAR, a name given to an audience-room in the palaces of the native princes of India. Hence it comes to mean a general reception or audience by a ruler in British India or by any officer of rank.

DURBHANGAH. See **DARBHANGAH** in **SUPP.**

DURGA, a Hindu divinity, one of the names given to the consort of Siva. She is generally represented with ten arms. In one hand she holds a spear, with which she is piercing Mahisha, the chief of the demons, the killing of whom was her most famous exploit; in another a sword; in a third the hair of the demon chief; and in others, the trident discus, axe, club, and shield. A great festival in her honour, the *Durga puja*, is celebrated annually in Bengal about the beginning of October, and lasts for about ten days in all. See **SIVA**.

DURMAST, a species of oak, *Quercus sessiliflora*, or according to some *Q. pubescens*, so closely allied to the common oak (*Q. Robur*) as to be reckoned only a variety of it. Its wood is, however, darker, heavier, and more elastic, less easy to split, not so easy to break, yet the least difficult to bend. It is highly valued, therefore, by the builder and cabinet-maker.

DUST-BRAND, the same as **SMUT** (which see).

DUTCH CLOVER, *Trifolium repens*, commonly called white clover, a valuable pasture plant. It has a creeping stem; the leaflets are broad, obovate, with a horse-shoe mark in the centre; and the white or pinkish flowers are in a globular head. See **CLOVER**.

DVORÁK (pron. *dvor-shahk*), **ANTONIN**, Bohemian composer, was born at Mühhausen in Bohemia on Sept. 8, 1841. At first intended for his father's trade of butcher, he showed such musical ability that he was allowed to study the organ. Going to Prague in 1857, he continued his musical studies under great financial difficulties. For a time he played the tenor violin in a theatre orchestra in the town, and he was also organist for several churches. In 1873 he first made himself known as a composer by a patriotic hymn for chorus and orchestra, and not long afterwards an opera of his was successfully produced. At this time he received a small pension from the government, and gained

the friendship of Brahms, who assisted in making his works known. His first great success was his setting of the *Stabat Mater*, first performed in England in 1883, which at once raised him to the rank of a popular and widely-known composer. Among his subsequent works are songs, operas, dances, symphonies, a wonderful cantata (*The Spectre's Bride*), first performed at Birmingham in 1885, the composer himself acting as conductor, and an oratorio (*St. Ludmilla*), first performed at Leeds in 1886 under his own direction. Dvorák is characterized by a brilliant imagination, great originality, and a rare inventive power. His *Stabat Mater*, which betrays less of the Bohemian nationality than many of his other works, is regarded as one of the greatest works of its kind in modern music. In 1890-92 he was instructor in composition at the Prague Conservatory of Music, and in the latter year he was called to New York as director of the newly established Conservatory of Music there.

DWINA. See **DVINA**.

DYER'S-BROOM, a European and now also North American shrub (*Genista tinctoria*), formerly used with woad for dyeing green. See **GENISTA**.

DYER'S-MOSS, a lichen, called also *Orchil* or *Archil*. See **ARCHIL**.

DYER'S-WEED, *Reseda luteola*, a British plant of the same genus as *mignonette*, otherwise called *Yellow-weed*, *Weld*, or *Woad*, and belonging to the *Resedaceæ*. This plant grows in waste ground, and is cultivated for the sake of its beautiful yellow dye. *Dyer's Greenweed* is *Genista tinctoria*. See **DYER'S BROOM** in **SUPP.**

DYNE, in physics, is the name now commonly used for the C. G. S. absolute unit of force. It is defined to be that force which would produce in a mass of 1 gram an acceleration of 1 centimetre per second. The corresponding British unit is the poundal, defined as above with the substitution of pound and foot for gram and centimetre respectively. One poundal is equal to about 13,850 dynes.

DYSPHONIA, a difficulty in speaking. The disorder known as 'clergyman's sore-throat' is a common example. Rest of the vocal organs, tonics, muscular exercise, change of scene, are generally needed to aid recovery.

DYSPNOEA, difficulty in breathing. It is sometimes hysterical, sometimes a symptom of disease of the heart or lungs. The treatment varies with the cause.

E.

EADIE, **JOHN**, **D.D.**, **LL.D.**, a popular Scottish preacher and theologian, was born at Alva, on 9th May, 1810. He was educated at the parish school in his native village, and afterwards at Tillicoultry. In 1826 he entered the University of Glasgow, and in due time attended the theological lectures delivered at the Divinity Hall of the Secession Church. When licensed to preach he was called to be the minister of a congregation in Glasgow, and in that city he laboured with great acceptance till his death. In 1843 he was elected professor of Biblical literature in the Divinity Hall of the Seceders, and began to contribute important articles to the *Eclectic Review* and to the *North British Review*. He also engaged himself on works in illustration of Scripture, commentaries, and other Biblical writings. He was

instrumental in bringing about the union of the Secession with the Relief church in 1847, which produced the United Presbyterian Church. In February, 1870, on the proposal to produce a revision of the Authorized Version of Scripture, he was elected as one of the seven Scottish coadjutors, in which capacity he gained and retained the respect of his fellow-workers. He died 3rd June, 1876. In 1844 Eadie received from Glasgow University the degree of LL.D., and in 1850 that of D.D. from St. Andrews. Among his best-known works are his *Biblical Cyclopedia* (1848); *Analytical Concordance to the Holy Scriptures* (1856); *The Ecclesiastical Cyclopedia* (1861); *Commentary on the Greek Text of the Epistle of Paul to the Ephesians* (1854), followed at intervals by *Commentaries on the Epistles to the*

Colossians, Philippians, and Galatians (1869). A Commentary on the Epistles to the Thessalonians was published after his death. Another important work published in 1876 in two volumes was The English Bible, being a critical history of various translations of the Scriptures.

EALING, a town and parliamentary division of Middlesex, the former a few miles west of London. It has some handsome modern places of worship, including five Established churches; free library, and science and art schools, both in one handsome edifice; training college for teachers of the deaf, &c. Pop. of town (1891), 23,979; in 1901, 33,040.

EARLE, REV. JOHN, Anglo-Saxon scholar, was born at Elston, near Kingsbridge, Devonshire, on Jan. 29, 1824. He was educated in the grammar-schools of Plymouth and Kingsbridge, whence in 1842 he went to Oriel College, Oxford. He took his B.A. degree in 1845 with first-class honours in classics, and in 1848 he was elected a fellow of his college. In the following year he took orders in the church, and was elected professor of Anglo-Saxon in Oxford University, an office which, in accordance with the then existing rule, he had to demit after five years. In 1857 he became rector of Swanswick, near Bath, a position which he still occupies, and in 1871 he was appointed a prebendary of Wells. In 1876 he again became professor of Anglo-Saxon in the University of Oxford, the five years' rule having by that time been rescinded. Of his numerous valuable contributions to the study of Anglo-Saxon and modern English the following are the most important: Gloucester Fragments of St. Swithun (1861); Two Saxon Chronicles Parallel (1865); The Philology of the English Tongue (1871); A Book for the Beginner in Anglo-Saxon (1877); English Plant Names from the Tenth to the Fifteenth Century (1880); Anglo-Saxon Literature (1884), a very useful and informing little manual; English Prose: its Elements, History, and Usage (1890); The Deeds of Beowulf (1892), a translation of the well-known Anglo-Saxon epic; The Psalter of 1539 (1894); and A Simple Grammar of English Now in Use (1898). He has also written a book on Bath, Ancient and Modern (1864).

EAR-SHELL, a name given to certain univalve molluscs of the genus *Haliotis* (which see in SUPP.).

EARTH, INTERNAL HEAT OF. There is abundant evidence that the interior of the earth is warmer than the surface. All deep mines, tunnels, and borings show a temperature considerably in excess of that which prevails in the shallower strata. At Rosebridge Colliery, near Wigan, a temperature of 94° Fahr. was found at the depth of 2445 feet, although the mean temperature of the surface is only about 49°. We have thus an increase of 45°, which is at the rate of about 1° for every 54 feet of depth. At Dukinfield Colliery, in Cheshire, a temperature of 75½° was found at a depth of 2055 feet. At Monkwearmouth Colliery, in Durham, a temperature of 71° was found at the depth of 1584 feet. In the Mont Cenis tunnel, at one part where there is a thickness of a mile of rock overhead, the temperature was 85°. The temperature at the depth of 400 metres in the wall of Grenelle at Paris is 75°, the temperature of the superficial strata being about 52°. In a bore through rock-salt at Spereberg, near Berlin, the temperature at the depth of 3490 feet was found to be 116°, the mean temperature of the air at the surface being only about 48°. At Yakutsk, in Siberia, where the mean temperature of the air is 18½°, it was found, in sinking a well to the depth of 540 feet, that the soil (which was frozen for the entire depth) increased in temperature by about 1° for every 52 feet of descent.

There is usually a considerable amount of irregularity in the rate of increase at different depths. For example, in the Spereberg bore, in descending by stages of 200 feet each, from the depth of 700 to that of 2100 feet, the amounts of increase were respectively 0°·8, 1°·2, 0°·2, 0°·9, 0°·7, 0°·9, and 1°·1. In a deep boring at Wheeling, West Virginia, the increase in the thousand feet from 2375 feet to 3375 feet is about 18°, while the increase in the next thousand feet is more than 16°, the temperature at that depth being 108°. Also, the mean rate of increase is by no means the same at all places, being sometimes as rapid as a degree for every 40 feet, and sometimes as slow as a degree for every 80 feet. Its average value appears to be about a degree (Fahr.) for 50 or 55 feet.

The simplest theory to account for the increase of temperature in descending is that which supposes that the earth has formerly been at a high temperature throughout and is gradually cooling, heat being conducted from the interior to the surface, and thence radiated away into external space. This theory has been fully developed by Lord Kelvin. Solid rock has greater specific gravity than melted rock, even at the same temperature. Hence, if the earth were originally melted, and were then subjected to loss of heat from its surface, the solid crust which would form would from time to time fall in and allow fresh portions of liquid to come to the surface, until a solid interior had thus been formed, containing perhaps numerous cavities filled with liquid, but having on the whole the characteristics of a solid globe. After this stage a few hundred years would suffice to make the surface nearly as cool as it is at present, although a temperature nearly as high as the melting-point of rock would still exist at the depth of a few feet. The cooling would gradually penetrate deeper, and the rate of increase of temperature with depth would become slower, until, after about 100,000,000 years, this rate would be reduced to the value which it has at present. If we suppose the earth not to have been originally melted, but to have had a temperature considerably below the melting-point, a still shorter period of time would suffice to bring about the present condition of things. Hence Lord Kelvin argued that the age of the earth, as a globe cool enough for habitation, cannot be greater than about 100,000,000 years. Professor Tait, on revising the physical data on which this calculation was based, came to the conclusion that the limit must be drawn still closer, namely, at about 10,000,000 years. If the earth has been originally melted and is now cooling, it appears from Lord Kelvin's calculations that the increase of 1° in about 50 feet which we observe near the surface extends to a depth of 100,000 feet or so. For greater depths the increase is sensibly slower, and at 800,000 feet is only ¼ as fast as at the surface, that is, is only about 1° in about 2550 feet. At the depth of about 100 miles the temperature is probably that of the melting-point of rock. As time goes on, the rate of increase in descending near the surface becomes slower, being inversely proportional to the square root of the earth's age, reckoned from the time when the surface was permanently solidified. Thus, when the earth is four times as old as at present, the rate of increase will be about 1° in 100 feet.

It was, until quite recently, maintained by geologists that the solid part of the earth consisted only of a thin crust inclosing a molten interior. This has been disproved by Lord Kelvin, both by the line of argument above sketched, and also by another argument based on the phenomena of the tides. A thin crust inclosing a liquid or pasty interior would yield and change its shape under the action of those forces (emanating from the moon and sun) which produce

the tides. Evidently if the surface and bottom of the sea at a given place rise together and fall together, the depth of water may remain unaltered. The observed effect is the difference between the tide at the surface and the tide at the bottom. Hence the observed effect will be greater with a rigid than with a yielding earth. Now the observed effect agrees with what calculation gives on the supposition that the earth taken as a whole is highly rigid, and is completely at variance with calculation on the supposition that the earth is highly flexible.

Volcanic eruptions have an obvious connection with the question of the condition of the earth's interior. According to one theory of their origin (propounded by Mr. Mallet) they are due to local generation of heat by friction. The outermost layers of the earth have long since attained a nearly permanent temperature. The layers below them are cooling more rapidly, and have therefore a tendency to shrink faster. This tendency finds its relief from time to time in dislocations, which are the source of earthquakes, and which frequently involve the rubbing of one part against another under the enormous pressure of the superincumbent weight. Such friction would certainly involve an enormous local development of heat.

EARTH-CLOSET, a place in which the fæces from the human body are received in a quantity of earth. The advantages of the earth-closet system are due to the fact that dry earth is one of the best disinfectants and deodorizers, and that the compound formed by the combination of the fecal matter and the earth is valuable and easily applied as manure. In large cities the earth-closet system would hardly be practicable on account of the expense of preparing and storing large quantities of earth, but in agricultural districts the system might be employed with great advantage.

EARTH-HOUSES, a name generally given throughout Scotland to underground buildings, also known as 'Picts' houses' or 'Picts' dwellings'. The earth-house in its simplest form consists of a single irregular-shaped chamber, formed of unhewn stones, the side walls gradually converging towards the top until they can be roofed by stones of 4 or 5 feet in width, all covered in by a mound of earth rising slightly above the level of the surrounding district. In the more advanced form of these structures two or three chambers are found. Earth-houses are frequent in the north-east of Scotland, occasionally thirty or forty being found in the same locality. Querns, bones, deer's horns, earthen vessels, cups and implements of bone, stone celts, bronze swords, and the like, are occasionally found in connection with them. Very similar structures, known as beehive-houses, occur in Ireland.

EARTH-NUT, the *Bunium flexuosum*, an umbelliferous plant with an edible nut common in woods and fields in Britain. The leaves are ternately divided, and the small white flowers are in terminal umbels. The tuber or nut is about 4 or 6 inches below the surface, at the termination of a long slender root. It is brown, the size of a chestnut, of a sweetish farinaceous nature, resembling in taste the common chestnut. The name is frequently applied to *Bunium Bulbocastanum*, which has a similar tuber. The earth-nut of Egypt is the tuber of *Cyperus rotundus* and other species of the same genus, that of China the subterranean pods of *Arachis hypogæa*, a leguminous plant.

EAST AFRICA, BRITISH, comprises an area of over 1,200,000 square miles situated to the north of German East Africa and south and west of Italian North-East Africa, and extending inland to the Congo State and the Anglo-Egyptian Sudan, but here the boundaries are not definitely settled. It

has a coast-line of about 450 miles, from the river Umba on the south to the river Juba on the north. This vast region has a population estimated at over 13,000,000, and includes Masailand and the Kenia Uplands, parts of Somaliland and Gallaland, Lakes Rudolf and Stefanie, the Albertine head-waters of the Nile, Lake Albert Nyanza, part of Albert Edward Nyanza, the northern part of Victoria Nyanza, the countries of Uganda, Kavirondo, Unyoro, Ankole, Koko, &c. Britain also has authority over the coast islands of Pemba and Zanzibar. In 1888 a charter was granted to a company called the Imperial British East Africa Company, from the initials of whose name the country was for a time called Ibesa, and on this body devolved the preliminary work of opening up the whole country. In 1893, however, the Company retired from Uganda owing to political and other difficulties, and the protectorate was declared in the following year over that portion of the country. In 1896 this Uganda protectorate was extended to the neighbouring regions of Unyoro, Uoga, Ankole, &c., and the whole district of Uganda is now placed under a commissioner resident at Port Alice on the western shore of Victoria Nyanza. In Uganda proper, however, the old monarchy still exists, the king's palace being at Mengo close to the British stronghold of Kampala. Forts have been established at various places, and are garrisoned mainly by Sudanese troops, part of whose duty is to restrain the Unyoro and other peoples from predatory incursions on their neighbours' territory. The construction of roads is being proceeded with, and a railway from Mombasa to Lake Victoria, completed in December, 1901, connects this important seaport with Kisumu on the north-east shore of the lake. There were until recently violent feuds between the adherents of the Mohammedans, Protestants, and Roman Catholics in Uganda, but these have now been quieted. All the rest of the country, with the exception of the islands of Zanzibar and Pemba, constitutes the East Africa Protectorate, declared in 1895. It is administered under the Foreign Office by a commissioner, and consul-general, who also acts as British agent at Zanzibar, and is divided into four districts or provinces. These are: (1) Seyyidieh, a coast province, with Mombasa as chief town; (2) Ukamba, with Machakora as capital; (3) Tana-land, capital Lamu; (4) Juba-land, capital Kismayu; and each is placed under the control of a sub-commissioner. Parts of this vast region are as yet very imperfectly known, but extensive districts are known to be fertile and capable of great development. The surface is greatly diversified. Inland, considerable portions form elevated plateaus, and the region embraces some of the highest mountains of this part of Africa, such as Mt. Kenia (18,370 feet), Mt. Elgon, and in the extreme west Ruwenzori. The most important rivers are the Nile and its head-waters, with the Tana, Juba, and Sabaki, entering the Indian Ocean. A considerable trade is carried on through the ports Mombasa, Lamu, Malindi (Melinda), and Kismayu, the chief imports being Manchester goods, Bombay cloth, brass, provisions, and the exports comprising mainly ivory, rubber, cattle and goats, grain, copra, hides, &c. The natives of Uganda and other parts show great skill in various arts, and great capacity for adaptation to European conditions and customs. Zanzibar and Pemba are still ruled by their Sultan, but form a British Protectorate, for which see separate article. See also UGANDA.

EAST AFRICA, GERMAN, is the name applied to a territory of about 380,000 square miles situated on the east coast of Africa, between the British and the Portuguese possessions there. Its coast-line extends from Cape Delgado, a little south of the

mouth of the Rovuma, northwards to the mouth of the Umba, being about 820 miles long. From British East Africa it is separated by a somewhat north-west line running from the mouth of the river Umba inwards to a point on Victoria Nyanza on the parallel of 1° s. lat., but turning north at one part so as to leave Mt. Kilimanjaro to Germany. Then the boundary runs westward across the lake, on the parallel of 1° s., to the Congo Free State boundary. On the west the boundary runs southward by Lake Tanganyika, and onwards to Lake Nyassa, subsequently following the north-east shore of that lake, and latterly passing down the river Rovuma to near its mouth, when it proceeds to Cape Delgado. Of this region it is estimated that only about one-fifth is suitable for pasture or tillage, and much even of that is very unhealthy to Europeans. The low coast-lands are succeeded some distance inland by the Usagara mountains rising to a height of about 6500 feet, and west of these is the dry and barren plateau of Ugogo, situated at from 3500 to 4000 feet above sea-level. Still proceeding westwards we pass through the dreary and arid Mgunda Mkhali or Land of Fire, covered with shrub and shingle with here and there projecting igneous rocks, to the fertile and well-watered plains of Unyamwezi, which extend for a long distance towards the lower basin of the Malagarazi on the east of Tanganyika. The highest mountain is Kilimanjaro, reaching 19,800 feet. Amongst the chief rivers are the Rovuma, Rufiji, Kingani, and Pangani, flowing to the Indian Ocean; the Kagera, Shimiyyu, and Ruwara flowing into Victoria Nyanza; and the Malagarazi flowing into Tanganyika. In the north there are several small lakes, and in the south-west the larger salt lake, Rukwa or Hikwa. On the coast the chief towns are Mikindani, Lindi, Dar-es-Salaam, Bagamoyo, Pangani, Wanga, and the English mission station Saadani. Inland there are Mpwapwa, Kanyenye, Tabora (Kazeh), Urambo, and Ujiji, the last-named being situated on the shore of Tanganyika. The country is under an imperial governor. The population is about 4,000,000, of whom about 1000 are Europeans. Coal, iron, copper, and salt are found, and also some gold. The exports are ivory, caoutchouc, sesame, gum, cocoa-nuts, &c., and the imports mostly consist of cottons, iron-ware, colonial wares, rice, oil, and spirits. A railway is in process of construction from Tanga on the north-east coast to Karagwe. The imperial government has to contribute a large sum for revenue purposes.

EAST AFRICA, PORTUGUESE, comprises a large territory south of German East Africa and east and north of the British possessions, having on the west chiefly the British Central Africa Protectorate, Northern and Southern Rhodesia, and the Transvaal. Its coast-line extends from Cape Delgado to Oro Point in the north of Tongaland (Natal), where the territory becomes very narrow. The area of this country is about 620,000 square miles, and the population is estimated at 1,600,000. It is divided into three districts, namely, Mozambique, Zambesia, and Lourenço Marques, and in addition there are the Inhambane and Gaza districts. The Mozambique Company administers Sofala and Manica, the Nyassa Company has jurisdiction in the northern part between Lake Nyassa, the Rovuma, and the Lurio, and there is also a Zambesia Company. There is a railway from Delagoa Bay to Pretoria, and one from Beira to Salisbury in Southern Rhodesia. The coast-lands are low-lying and not very healthy, but in the region of the Namuli mountains there is one of the finest and most beautiful tracts of country in the whole continent. There are several important rivers,

including the Zambesi, Limpopo, Rovuma, Sabi, Pungwe, Lurio, Mtepswezi, Lukuga, and many others. The most important towns are Lourenço Marques, Inhambane, Sofala, Beira, Quilimane, Chinde, Mosambique, Ibo, Zumbo, Tete, and Sena. Gold is found in the Manica region on the west, and has been worked by British capitalists. The most important exports are timber, drugs, gold-dust, ivory, cotton, coffee, gum, rubber, tobacco, rice, indigo, honey, and salt; and amongst imports are cotton goods, spirits, beer, and wine.

EASTERN ARCHIPELAGO. See MALAY ARCHIPELAGO.

EASTERN QUESTION, the name given to the diplomatic and national interests affected by the gradual retrocession of the Turkish Empire in Europe, and the problem of disposing of the territory thus left, or presumably to be left. Bulgaria, Roumania, Servia, and Greece are the new states which have naturally arisen on the withdrawal of the Turkish power, and their history in connection with the respective policies of England, France, Austria, and Russia towards them is the history of the phases of the 'Eastern Question' so far. The Crimean war of 1854-56, with the Treaty of Paris which followed; the Russo-Turkish war of 1877-78, with the Treaty of Berlin; and the Greco-Turkish war of 1897, are amongst the notable events connected with this subject. British diplomacy on this question has mainly aimed at checking the attempts of Russia to extend her empire and strengthen her strategic position by the absorption of part or all of the territory now belonging to the decaying Turkish empire. Of late years, however, the meaning of the phrase has been much extended, and may now be said to embrace the problem of preventing the aggression of Russia, either in Europe or Asia, from becoming a menace to the authority or commerce of Britain. The Russo-Chinese phase of the subject is the most recent one, and arose after the Japanese triumph of 1895 had shown the essential military, naval, and administrative weakness of China. The Turkish atrocities in Armenia showed how jealous of each other the Great Powers are in connection with these questions.

EASTERN ROUMELIA. See RUMELIA (EASTERN) and BULGARIA.

EASTWARD POSITION, the position assumed by many clergymen of the Anglican Church during part of the communion service, the clergyman being placed in front of the communion table with his back to the congregation. This position has been a cause of much controversy. It was decided, in 1870, that such a position during the prayer of consecration is illegal; but if the 'manual acts' of the priest are visible, the position appears to be legal by a decision of 1891.

Eau Claire, a city of the United States, capital of Eau Claire county, Wisconsin, at the junction of the Eau Claire and Chippewa rivers, 150 miles north-west of Madison. It is the chief commercial centre of the north-west part of the state, its principal trade being in lumber, of which vast quantities are here annually manufactured. It has a large number of saw-mills, planing-mills, grist-mills, foundries, &c., and there are also manufactures of boots and shoes, dynamos and other machines, pearl buttons, paper, &c. Pop. (1890), 17,415.

EBERSWALDE, formerly known as NEUSTADT-EBERSWALDE, a town of Prussia, on the Finow Canal, about 28 miles north-east of Berlin by rail. It is a busy industrial centre, having a number of machine-shops, saw-mills, paper-mills, and iron-works, and doing a considerable trade in timber,

coal, &c. There is a royal forest academy here. It is a favourite resort of the Berliners during summer. Pop. (1895), 18,288; (1900), 21,614.

ECCLÉS, a municipal borough of England, in Lancashire, 4 miles from Manchester, of which it may be considered a suburb, pleasantly situated on the Irwell. Among the buildings may be mentioned the town-hall and the fine parish church of St. Mary. There are numerous cotton-mills. Pop. (1891), 29,638; (1901), 34,369.

ECCELESTIASTICUS, the title of a book placed by Protestants and Jews among the apocryphal writings. The author calls himself Jesus the son of Sirach. Originally composed in Hebrew, probably about 200 B.C., the book was translated into Greek by the grandson of the original author. The Hebrew text was known to Jerome, but it was afterwards entirely lost except a few quotations in the Jewish Talmud. Some considerable fragments of it have recently been discovered in Egypt. The earliest quotations of this book by a Christian writer are found in the works of Clement of Alexandria, who, with many subsequent Christian teachers, alludes to it as Scripture. As regards its contents, it consists of many scattered and imperfectly grouped aphorisms and maxims, which at times descend to the minutest details of agriculture, medicine, &c. Some authorities have held that it originally consisted of three distinct books which later were united, these three corresponding in some measure to the books of Solomon.

EOHUCA, a rising Australian town, in the colony of Victoria, on a peninsula at the junction of the Campaspe with the Murray, over which is an iron railway and roadway bridge, connecting it with Moama in New South Wales. It has a trade (partly by the river) in timber, wool, &c., and the vine is cultivated in the neighbourhood. Pop. about 5000.

EDELWEISS ('Noble-white'; *Gnaphalium leontopodium*), a perennial plant of the order Compositae, growing at high altitudes in the Alps, and also in parts of Austria and Siberia. Its flower is white and somewhat star-shaped. Its flower-heads are surrounded with a characteristic woolly involucre, and its leaves have also the same woolly character. It is comparatively scarce, and often grows in inaccessible positions, and the supposed difficulty of gathering it is the groundwork of various legends and poems. The emblem of purity, it is given by the Tyrolean youth to his affianced bride. It is not difficult to cultivate, but is apt to lose its distinctive woolly character under cultivation.

EDINBURGH, DUKE OF, H.R.H., Prince Alfred Ernest Albert, latterly the reigning duke and sovereign of Saxe-Coburg-Gotha, the second son of Queen Victoria, was born at Windsor Castle, Aug. 6, 1844. At the age of fourteen he joined the navy as naval cadet, and served on various foreign stations. In 1862 he declined the offer of the throne of Greece. On his majority he was awarded an annuity of £15,000 by parliament, and was created Duke of Edinburgh, Earl of Kent, and Earl of Ulster. In 1867 he was appointed to the command of the frigate *Galatea*, in which he visited Australia, Japan, China, India, &c. In 1873 he received an additional annuity of £10,000, and next year he married the Grand-duchess Marie, only daughter of the Emperor of Russia. In 1882 he was made a vice-admiral, and subsequently held important commands, being also created Admiral of the Fleet. In 1893 he succeeded his uncle as ruler of Saxe-Coburg-Gotha, and resigned his annuity of £15,000. He died on July 30, 1900, leaving four daughters, and was succeeded by his nephew, the Duke of Albany.

EDISON, THOMAS ALVA, an American inventor,

was born at Milan, Ohio, on February 11, 1847. He was poorly educated, became a news-boy on the Grand Trunk Railway, and afterwards, having obtained some type, issued a small sheet of his own on the train. He then set himself to learn telegraph work, and in a short time became an expert operator. In 1863, while at Indianapolis, he invented an automatic telegraph repeater. This was the first of a long series of improvements and inventions. He opened an extensive establishment at Newark for the manufacture of electrical, printing, automatic, and other apparatus. In 1876, his health breaking down, he gave up manufacturing and devoted himself to investigation and invention. Amongst his numerous inventions are the quadruplex and sextuplex telegraph, the carbon telephone transmitter, the 'Edison system' of lighting, the electric fire-alarm, the 'Edison electric railway', the phonograph, the photometer, and the kinetograph. He has a large and well-equipped laboratory at Orange, New Jersey. See articles on **PHONOGRAPH**, &c.

EDRIOPHTHALMATA. See **CRUSTACEA**.

EDWARD VII., King of Great Britain and Ireland and Emperor of India, was born at Buckingham Palace on the 9th of November, 1841, and baptized as Albert Edward. He is the eldest son and the second child of the late Queen Victoria and the Prince Consort, Prince Albert of Saxe-Coburg. On Dec. 14 in the year of his birth he was, as her apparent, created Prince of Wales. After receiving a careful education under private tutors he studied at the universities of Edinburgh, Oxford, and Cambridge. In the summer of 1860 he visited Canada, where he was enthusiastically received, and by the special invitation of President Buchanan he extended his visit to the United States, where his reception was no less cordial. He was appointed a brevet colonel in the army in 1858, and three years later he was attached to the Curragh camp in Ireland. In Oct. 1861 he was made a bencher of the Middle Temple. In 1862 he was promoted to the rank of general, and in the spring of that year he set out on a visit to Egypt, Palestine, Syria, and Athens in company with the Rev. Arthur Penrhyn Stanley, who afterwards became Dean of Westminster. After the Prince's return from the East he was introduced at the Privy Council, in 1863 he took his seat in the House of Lords, and about the same time he formally gave up his right to succeed to the duchy of Saxe-Coburg-Gotha. On March 10, 1863, at St. George's Chapel, Windsor Castle, he was married to the Princess Alexandra, eldest daughter of the King of Denmark. From this time onwards the Prince discharged many important public ceremonial functions in various parts of the United Kingdom. Near the end of 1871 he was attacked by typhoid fever, and for a time it seemed as if his death were imminent, but he passed the crisis safely and had completely recovered early in 1872. On Feb. 27 of that year his recovery was made the occasion of a special thanksgiving service in St. Paul's Cathedral. In Oct. 1875 he sailed from Dover on his great journey to India. He arrived at Bombay in November, and between that date and his departure for England in March 1876 he visited the chief provinces, states, and cities of the Indian Empire, being everywhere received with the utmost cordiality and respect. With the Princess he made an extended tour through Ireland in 1885, and in 1888 his silver wedding was celebrated. The establishment of the Imperial Institute as a memorial of the jubilee of the late queen (in 1887) was mainly due to his suggestion and exertions. In 1893 he sat on the Poor Law Commission, and in 1896 he was appointed Chancellor of the newly created University of Wales. In the

diamond jubilee year (1897) he established the Prince of Wales's Hospital Fund for the better financial support of the London hospitals. At the great naval review of that year he represented Queen Victoria. By the death of his mother on Jan. 22, 1901, he became King of Great Britain and Ireland and Emperor of India, and has elected to be known as Edward VII. On Feb. 14 he and Queen Alexandra opened Parliament in state. To him and Queen Alexandra have been born: Albert Victor Christian Edward, Duke of Clarence and Avondale, born Jan. 8, 1864, died Jan. 14, 1892; George Frederick Ernest Albert, Duke of Cornwall and York, now Prince of Wales, born June 3, 1865, married July 6, 1893, to the Princess Victoria Mary of Teck; Princess Louise Victoria Alexandra Degmar, born Feb. 20, 1867, married July 27, 1889, to the Duke of Fife; Princess Victoria Alexandra Olga Mary, born July 6, 1868; and Princess Maud Charlotte Mary Victoria, born Nov. 26, 1869, married July 22, 1896, to Prince Charles, second son of the Crown Prince of Denmark.

EDWARDESÁBÁD, a town and cantonment in Hindustan, head-quarters of Bannu district, North-West Frontier Province, founded in 1843 by Major (afterwards Sir) Herbert B. Edwardes. It has a considerable trade, but is situated in an unhealthy district. Pop. (1891), 8817.

EDWARDS, AMELIA BLANDFORD, an English novelist, was born in London in 1831. As far back as 1853 she began to contribute to periodicals. Among her best-known novels are *Hand and Glove* (1859); *Half a Million of Money* (1865); *Lord Brackenbury* (1880). Besides novels, Miss Edwards wrote ballads and books of travel (such as *Untrodden Peaks and Unfrequented Valleys*, *A Thousand Miles up the Nile*, &c.); and latterly devoted herself to Egyptology, to which science she made some valuable contributions, while she also left funds to endow a chair of Egyptology in University College, London. She died at Weston-super-Mare on April 15, 1892. Miss A. B. Edwards is not to be confounded with her cousin, **MATILDA BETHAM-EDWARDS** (born 1836), who has written a number of popular novels besides various other books. Among the former may be mentioned *John and I*, *Doctor Jacob*, *Kitty*, *The Sylvesters*; among the latter, *A Winter with the Swallows in Algeria*, *Holidays in Eastern France*, *A Year in Western France*, *France of To-day*, &c.

EEL-POUT. See **BURBOT**.

EGG, an island of Scotland. See *Eigg*.

EGGLESTON, EDWARD, American novelist and miscellaneous writer, was born at Vevay, Indiana, on December 10, 1837. He entered the ministry of the Methodist Church, and was more or less engaged in pastoral work for a number of years, at the same time contributing to various periodicals, for some of which he acted as editor. From 1874 till 1879 he was engaged in the work of an independent church founded by himself (the Church of Christian Endeavour, Brooklyn), but in the latter year his health broke down and compelled him to resign his position as pastor. Since then he has devoted himself entirely to literary work. Among the most important of his works are *The Hoosier Schoolmaster* (1871); *The End of the World: a Love-story* (1872); *Mystery of Metropolisville* (1873); *Schoolmaster's Stories for Boys and Girls* (1878); *The Circuit-Rider: a Tale of the Heroic Age* (1874); *Christ in Literature* (1875, edited by him); *Christ in Art* (1875, edited); *Roxy* (1878), a popular novel; *The Hoosier School-boy* (1883); *The Graysons: a Story of Illinois* (1887); *History of the United States and its People, for the use of*

schools (1888); *Household History of the United States and its People* (1888); *The Faith Doctor* (1891); *Duffels*, a series of short stories (1893); *The Beginners of a Nation* (1896); and, with his brother and his daughter, *Famous American Indians* (5 vols., 1878-80). His novels are very popular in the United States on account of their wealth of incident, skilful handling of dialect, and realistic portraiture. He has also contributed largely to the *Century Magazine*.

EGHAM, a village of England, in the county of Surrey, on the Thames, $\frac{1}{4}$ mile west of Staines, and about 21 miles from London, with the Royal Indian Engineering College, the Royal Holloway College for Women, and the Holloway Sanatorium, Runnymede, where King John signed Magna Charta, is in Egham parish. Pop. of parish (1891), 10,187.

EGRIPO, a name of Chalcos (which see).

EHRENBERG, CHRISTIAN GOTTFRIED, a German scientist, was born at Delitzsch on April 19, 1795, and died at Berlin on June 27, 1876. After studying theology, medicine, and natural history at Leipzig and Berlin, he joined in 1820 an expedition to Palestine, Egypt, and Abyssinia, returning to Berlin in 1825. In 1829 he accompanied Humboldt to the Ural and Altai ranges and to Central Siberia. His great work on *Infusoria* (*Die Infusionstierchen als vollkommene Organismen*) appeared in 1838, and was at once recognized as the highest authority on the subject. It was followed in 1864 by his *Microgeology*. Ehrenberg's work gave an enormous impetus to the study of microscopic organisms. He was the first to show that the phosphorescence of the sea is due to the presence of hosts of animalcules. There is a *Life by Lane* (1895).

EIBENSTOCK, a town in the south-east of Saxony, near the Mulde, with important manufactures of lace. It is connected by rail with Chemnitz, about forty miles distant. Pop. (1895), 7212.

EISENBERG, a town of Germany, in the duchy of Saxe-Altenburg, 24 miles west of Altenburg, with a ducal palace and various manufactures. Eisenberg is a very old town. Pop. (1895), 7956.

EJOO, a kind of fibre. See **GOMMUTI PALM**.

EKATERINODAR, a town of Russia in the Caucasus. It is the chief town of the Kuban territory, on the river Kuban, and is a poorly-built place with a considerable trade. The surrounding country is swampy. Pop. (1897), 65,697.

ELAGABALUS. See **HELOGABALUS**.

ELAM, the ancient name of a country or region in Asia, east of the Lower Tigris. A king of Elam is said in the cuneiform inscriptions to have conquered Babylonia and Assyria about 2300 B.C. It was latterly incorporated in the Persian Empire. The later ancient writers call this country Susiana, the name being derived from its capital, Susa, one of the most ancient cities of the East. Both the country itself, which seems to have been of considerable importance at an early period, and its capital (Shushan) are mentioned in the Bible.

ELASMOBRANCHII, an order of fishes, including the sharks, dog-fishes, rays, and chimaera. See **ICHTHYOLOGY**.

ELECTRICITY, MEDICINAL APPLICATIONS OF. The recognition of electricity as a force inherent in natural bodies led physiologists to experiment with a view to ascertain the conditions under which it was exerted, and also the relations which it might be supposed to assume to muscle and nerve-force (see **NERVE**), and to other actions of the living organism. At a very remote period of antiquity the electrical force exhibited by such fishes as the *Torpedo* (which see) or *Electric Ray* was utilized for

the cure of certain diseases. Thus, we find Dioscorides recommending the application of the Torpedo to the extremities of patients afflicted with rheumatic and like pains, for the purpose of removing and curing these ailments. The modern physician employs electricity in a variety of ways as a nervous stimulant. Thus, where a powerful effect is required the Leyden-jar is used; but this form of application is admittedly of too violent and unmanageable a nature to be of much service. Most frequently electricity is applied as a therapeutic agent by the aid of some appliance producing *faradization*, or the exhibition of discontinuous or interrupted electrical currents. The magneto-electric machine affords a ready means of producing a readily graduated and interrupted current, and is much employed in cases of paralysis and less severe cases of nervous weakness. The chief diseases in which electricity appears of service are cases of mild nervous lesions, rheumatic affections, neuralgia, amenorrhœa, and other functional disorders of the female generative system; constipation, depending on nervous debility; &c. Electro-puncture and electro-cautery have also been successfully used in medicine, the former in the treatment of aneurism, the latter for the removal of tumours, &c. The application of electricity in modern physiology is chiefly used to demonstrate the existence and relations of nerve-force and muscular contractility. The famous experiment and discovery of Galvani, who found that electrical currents produced contractions in the muscles of a recently killed frog, may be said to have given birth to a variety of highly intricate apparatus now seen in the laboratories of physiologists. Thus, we have myographs for determining muscle force; and other complicated apparatus, in which electricity is not only the chief element employed in demonstrating the properties of the living tissues, but in which also the results of experiments are chronicled by aid of delicate galvanometers and similar apparatus.

The electric shock produced by the discharge of electricity through a living animal is a violent disturbance of the muscles. Such a shock is often powerful enough to destroy life, and in America electricity has been used in the execution of criminals. Death from lightning is simply death from an electric shock. It takes a powerful battery to give what would be called a shock on opening or closing the circuit, but a small battery connected with a Ruhmkorff's coil gives a succession of currents producing very decided physiological effects. The fingers close on the handles, which are at the ends of the wires from the secondary coil, and it is impossible for the victim to let them go till he is relieved by the operator. The most convenient form of instrument for giving this kind of effect is a machine in which two coils, wrapped on soft-iron cores, revolve between the poles of a permanent magnet.

ELECTRIC RAILWAY, ELECTRIC TRACTION. The first exhibition of a practicable electric tramway was made at a Berlin Exhibition in 1879. The first application of electric traction to commercial work was the experimental electric railway built between Berlin and Lichterfelde in 1881. On this line the rails were used as conductors. The first electric line in the United Kingdom was installed between Portrush and the Giant's Causeway in 1883. This was followed within a few months by the Beasbrook-Newry and Blackpool lines. From this period no real interest in electric traction was shown in Great Britain until very recently. Its latent possibilities were developed in America, where, between 1883 and 1888, several companies were actively engaged in developing electric traction. Two systems were on trial. In the one the conductors were carried in

a conduit laid between the metals, electrical connection between conductors and motors being maintained by means of a contact 'plough' hung from the car, which passed through a slot in the conduit at the street surface, and rubbed against the positive and negative conductors, which were placed on insulated supports on either side of the conduit structure. In the other, the current was conveyed by an overhead wire along the line, and thence brought to the car motors through a trolley-pole supporting a wheel which pressed against the under surface of the overhead wire, the current returning to the generating station through the metals. Owing to the great initial cost of the conduit system and the imperfect electrical machinery then available, the energy of the various inventors was for many years directed to the overhead system. The first considerable installation of electric traction was made in Boston, U.S.A., in 1889, and the successful application of electricity to traction dates from that year.

In 1890 there were in the United States, approximately, 2500 miles of electrically equipped tramway lines operating 5500 motor-cars. At present there are, approximately, 21,000 track miles and 68,000 motor-cars in the United States. In Great Britain, till the opening of the Bristol tramways in 1895, practically nothing had been done since the building of the first early lines. Since then electric traction has rapidly progressed, and now there are some 1000 miles of electric tramways in the United Kingdom. Vastly greater progress has been made on the Continent and in the Colonies. It is scarcely too much to say that nearly every tramway and light railway in the world is now electrically worked, or is considering the ways and means of electrically equipping at the earliest possible moment.

An electric traction installation consists of four main parts. First, the power station, in which the electrical current is generated by dynamos driven by steam or water power. Second, the motors on the cars, actuated by the current supplied from the power plant. Third, the electrical conductors, either overhead or underground, which convey current from the power plant along the line, and with which the motors are flexibly connected. Fourth, the permanent way.

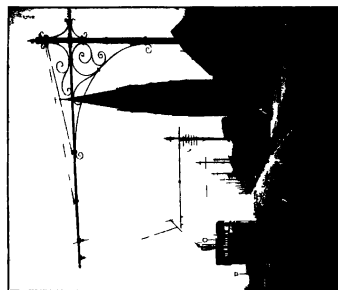
Much better regulation and service has so far been obtained with continuous than with alternating currents. The uniform pressure at which continuous current is supplied to a tramway line is approximately 500 volts, this limit having been adopted, inasmuch as shocks sustained by human beings from such a voltage are practically harmless. The power required is, however, not always generated in the first instance as continuous current. Where power must be transmitted great distances, the use of alternating or *polyphase* currents is often necessary for economy in transmission. In these cases substations are maintained at various points along the route, at which, by means of simple machines, known as rotary converters, the polyphase current transmitted from the generating plant is transformed into continuous current before being passed into the line conductors.

In early days there were no thoroughly reliable dynamos, and the best frequently broke down. As the steam-engine was then standard and to be relied upon, it was the practice to run several small dynamos from one steam-engine by means of belts, counter-shafting, and friction-clutches, arranged so that any dynamo could be driven from any engine in the plant. As improvements were made in electrical apparatus, the waste of power resulting from the use of small units and counter-shafting was done away with. Electrical machinery has now so far

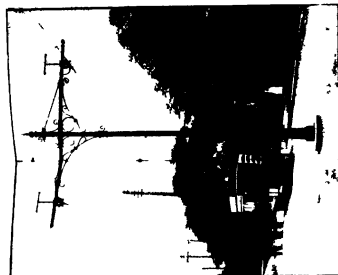
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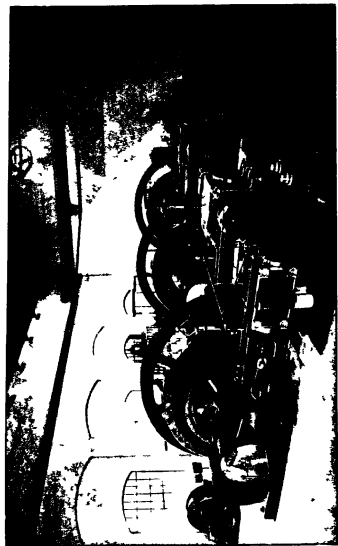
Single trolley wire on side poles



Double trolley wire on side poles

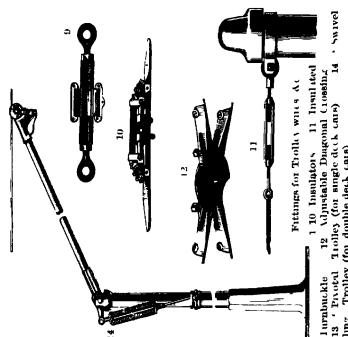
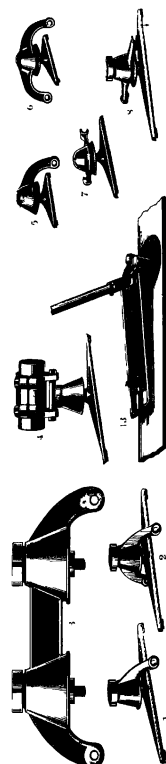


Double trolley wire on center pole



Electric Trolley Station (Reynolds Cables Page 5)

TYPICAL METHODS OF OVERHEAD CONSTRUCTION



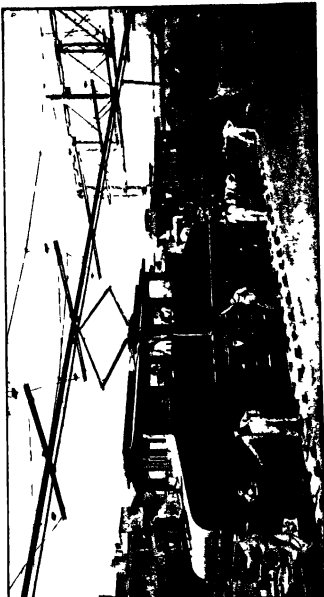
Figures for Trolley wire A.S.
1 10 Insulators 11 Insulated
12 Adjustable Diagonal Clamping
13 Trolley for single deck cars 14 Trolley for double deck cars



Typical British Double deck car



Standard trolley equipped with wheel contacts is supported by trolley beam



American Electric Locomotive

advanced that it is usual to directly couple one or two dynamos to each engine.

The first motors were firmly connected to the car-body, and drove the axles by means of leather belts or chain gears. Double reduction by means of spur and gear wheels was next introduced, and now single reduction, using one pinion and one gear wheel, is universal. Commercial tramway motors run at between 800 and 500 revolutions per minute. The first electric motor was a small dynamo. It was soon found that the parts of such a machine were too easily accessible to moisture and dirt, and were or burnt out. The introduction of carbon brushes to transmit current to and from the revolving armature, the use of drop-forged copper instead of cast copper for the commutators or collectors, the introduction of cast-steel in the place of wrought or cast iron, the wire-coils being made absolutely waterproof, and the adoption of fireproof insulating material, were important factors which made the closed-in, waterproof and fireproof motor of to-day possible. The efficiency of electrical machinery now reaches 94% in the case of generators and nearly 90% in motors.

Great difficulty was at first found in economically varying the speed of electric motors, the only known method being the introduction of resistances to absorb, and waste, any excess of power over the amount required at a given time. The introduction of the series parallel controller, by which the armatures and field-magnets of the motors can be interconnected in different combinations to give varying speeds, at high efficiency, has greatly conduced to the economy of electric traction. The introduction of the magnetic blow-out, by which the spark which has a tendency to form when a current is broken is extinguished, the improvement in switches and lightning-arresters, and the simplification and standardizing of connections so that ordinary mechanics can equip a motor-car, have had important results.

The introduction of the 'under-running' trolley, consisting of a small gun-metal wheel at the end of a steel pole, pressed against the underpart of the trolley wire by springs, was the earliest important step in advance. The use of a trolley wheel supported on a swivel, which allows the conducting wire to be placed at any point within 10 feet of the centre of the track, has been largely adopted in England, and has much improved the appearance of overhead lines. The adoption of ornamental centre brackets and side brackets to support the trolley wire in the place of suspension wires crossing the roadway is also a marked factor in English practice.

In all roads of considerable importance, current is supplied from the power station to the service conductors by means of copper insulated feeder cables, laid directly in the ground or drawn through iron, earthenware, or cement-lined pipes. These main cables are brought every half-mile into junction boxes which contain switches and lightning arresters. Flexible cables running up through the poles connect these switches to the overhead wire. Should anything go wrong on the line, any section can be entirely isolated without stopping the service. From the overhead wire, the current passes through the trolley to the controllers placed at either end of the car. In these controllers, which the driver operates by means of a handle, the current is sub-divided, or entirely cut off, as required, and the various positions of the controller-handle produce the various speeds of the motors. A lightning arrester, a safety switch, and a fuse which is destroyed in the case of anything going wrong with the motor, or in case of a lightning discharge, are also fitted to each car. The motors return the current by means of the wheels to the rails, which take the current back to the

station, where they are connected by means of heavy cables to the governing apparatus on the switch-board. To make this return circuit effective and certain, and to prevent the current returning by earth, or by gas and water pipes which it might damage, the rail-ends are connected either by means of copper "bonds" bridging the joints and securely wedged into both ends of the rails, or by mercurial plugs pressed tightly between rails and fishplates, or by means of casting masses of iron around the joints after the rails are in position.

The sub-surface conduit system of conductors has been employed in a few American and European cities, and from a mechanical and technical point of view is fairly satisfactory. The cost of this method of construction has been found to be approximately ten times the cost of the best overhead construction. The interference during construction with the surface of the roadway, and with the various gas, water, telegraph, and other municipal services, is very great. Where the overhead wire is prohibited, the traffic great, and first cost a matter of no special consideration, the conduit will undoubtedly be used.

The use of accumulators, or storage batteries, has made little progress for traction purposes. The great weight of the cells, the necessity of frequently changing them, and especially the great cost of maintaining them in good condition, has militated against their use. Accumulators are, however, very frequently used in power-generating stations as a reserve of power which can be called upon to take up sudden and unexpected demands, or to supply power early and late when only a few cars are moving on the line. In several continental cities, where local regulations prohibit the erection of overhead wires in principal thoroughfares, a battery of accumulators is carried by each car. These are charged with current while the car is on the section of line where the use of the overhead wire is allowed, and are utilized to supply motive power along that part where no conductors are available.

Electrical power is now largely used in America to operate branches of steam railway systems, especially where the distances to be traversed are comparatively short, the stops frequent, and the traffic heavy. In Chicago and New York, electricity has taken the place of steam in working the elevated railway-trains which connect the business centres with the suburbs. All the new underground railways of London and Paris employ electric locomotives. Experience has demonstrated beyond doubt that in rapid acceleration of speed and quickness of stops, without increase of maximum speed, electricity vastly surpasses steam, and that by its use average speed can be greatly increased and the time between two stations greatly reduced.

In cases where a railway owns its permanent way, free from interference from outsiders, the current is conducted to the motors by means of a third rail laid along the way and supported by insulators from the sleepers. This conductor rail is made electrically continuous by bonds, just as the traffic rails which form the return circuit. Cast-iron shoes, depending from the motor-car or locomotive and pressed down on the third rail by means of springs, collect the current from the conductor rail and take it to the motors. From the motors the current returns to the station by means of the traffic rails. For this class of work, three methods of arranging the motive power have so far been used: First, the independent electric locomotive hauling trains just as an ordinary steam locomotive would. Second, the system of fitting ordinary passenger or goods cars with motors, trail cars being hauled as required. Frequently two such motor-cars are placed one at either end of a

train, and are interconnected electrically, so that the motors on both cars can be worked from either end of the train. The third and latest method is known as the multiple-unit system. In this case each car forming a train has one or more motors, and is an independent motor-car. Each car can be worked by itself, if necessary, by means of controllers similar to those used on tramways. When a train is made up of such motor-cars the motors are all interconnected, and can be worked from either end of the train or from any individual car by a special controller. Such controllers have been worked both electrically and by means of compressed air. This system of multiple control has the advantage of requiring less power and of allowing the trains to be divisible into independent units.

Electricity has for a long time past been used for hauling minerals in mines and on the surface. Small independent locomotives and overhead conductors are used. Electric power is now used on a large scale for shunting in goods yards and for hauling trucks on sidings and in large works. It is usual to employ a flat truck which can carry goods as well as act as a locomotive. There seems to be no limit to the possible application of electricity to traction. It has already demonstrated its great superiority over any form of mechanical power for every use where it has been given a trial. The only remaining field is the main-line railway, now operated by steam, and it would seem that we are not far off from the time when the progress of science and invention will fully develop apparatus which may permit its successful and economical adoption in that field.

ELECTRO-PLATING. See **ELECTRO-METAL-URGY.**

ELEPHANT-SEAL, the Proboscis Seal, or Seal-elephant, the largest of the seal family (Phocidæ). There are probably two species, one (*Macrorhinus angustirostris*) found only on the coast of California and Western Mexico, the other (*Macrorhinus leoninus*) found in Patagonia, Kerguelen Island, Heard's Island, and other parts of the Southern Seas. They vary in length from 12 to 30 feet, and in girth at the chest from 8 to 18 feet. The proboscis of the male is about 15 inches long when the creature is at rest, but elongates under excitement. The females have no proboscis, and are considerably smaller than the male. Both species are becoming rare from the continual slaughter to which they have been subjected.

ELEVATOR, an apparatus for raising or lowering persons or goods from different levels in warehouses, hotels, &c., consisting usually of a cage or fenced platform moved by hydraulic power. Elevator is the term commonly used in America; *lift* or *hoist* is more common in Britain. The name is also commonly given to a mechanical contrivance consisting of a series of boxes or buckets attached to a belt travelling round two drums, one above and one below, for discharging grain from vessels, and lifting it from one floor to another in the store-house. Hence the term is also applied to the building in which the grain is stored and handled, and elevators or stores of this kind are often buildings of immense capacity, such as are to be seen at Chicago and other centres of the grain trade.

EL FASHER, capital of Darfur in the Egyptian Soudan. It lies at the foot of the eastern slope of the Jebel Wanda, and there is an important trade-route connecting it with Dongola on the Nile. Another town of the same name stands on the river Atbara, near the Abyssinian frontier. It is a much-frequented crossing-place.

ELGIN, a city of the United States, in Kane

county, Illinois, on Fox River, 36 miles west by north of Chicago. It has a very large watch-factory and various flourishing industries. It is an important dairy centre. Pop. (1890), 17,828.

EL HASA, a fertile district of eastern Arabia, on the Persian Gulf, belonging to Turkey. It produces dates, wheat, millet, rice, &c. Pop. estimated at 160,000, and area about 81,000 square miles. It contains the towns El Katif, El Hofuf, and Koweit.

ELIOT, SIR JOHN, one of the ablest of the popular leaders of Charles I.'s reign, of an old Cornwall family, was born at Port Eliot, in Cornwall, about April 20, 1592. He entered parliament in 1614 as member for St. Germans, winning immediate reputation as an orator. As vice-admiral of Devon he was energetic in suppressing piracy. In the three parliaments of 1623, 1625, 1626, he made his way to the front of the constitutional party, joined Hampden and the rest in refusing contributions to the forced loan, and took a prominent share in the impeachment of Buckingham and in drawing up the Remonstrance and Petition of Right. He was imprisoned in the Tower in 1629, and died of consumption in confinement on Nov. 27, 1632. During his imprisonment he wrote a work on constitutional monarchy, entitled the *Monarchy of Man*, and several other works, including an account of the first parliament of Charles I. under the title *Negotium Posterorum*; a vindication of his public conduct, entitled *An Apology for Socrates*; and *De Jure Majestatis*, a treatise on government. Eliot was not a republican, but believed in constitutional monarchy, and all through his career boldly maintained the privileges of parliament both in its individual members and as a legislative and executive body. See his *Life* by Forster (2nd ed., 1871).

ELISSABETHGRAD. See **ELIZABETHGRAD.**

ELIZABETHPOL, a town of Russia, in the Caucasus, capital of the government of same name, covering a great space of ground from the gardens and open areas it contains, but very unhealthy. Pop. (1897), 33,022. The government has an area of 16,721 sq. miles, and a population (1897) of 888,954. It is partly mountainous, partly steppes, and produces grain, cotton, tobacco, wine, &c.

ELKHART, a town of Indiana, United States, at the confluence of the St. Joseph and Elkhart rivers, about 100 miles from Chicago in an easterly direction. It has machine-shops, railroad works, paper-mills, &c. Pop. (1890), 11,360.

ELLICE, or **LAGOON ISLANDS**, a group of coral islands, situated north of the Fiji and north-west of the Samoan group. They extend for 360 miles in a direction N.W. to S.E., and form nine groups, the largest islands being Sophia or Rocky Island, Nukulailai or Mitchell, Ellice, Nukufetau, Vaitupu, Netherland, and Lynx. The inhabitants almost all speak a Samoan dialect, and have traditions of a migration from the Samoan islands. They have long been Christianized, and reading and writing are general. The cocoa-nut is widely cultivated. These islands were annexed by Britain in 1892. Area, 14 sq. miles. Pop. 2400.

ELLICHUR, a town of India, in Ellichpur district, Berar, once large and prosperous. There is a military cantonment within two miles. The town contains many interesting ruins, including a palace, several fine tombs, and an old well. Pop. (1891), 36,240.

ELLICOTT, RIGHT REV. CHARLES JOHN, English divine, was born at Whitwell, Stamford, on April 25, 1819, and was educated at St. John's College, Cambridge, where he graduated at the age of twenty-two. After being professor of divinity in King's College, London, Hulsean lecturer and

Hulsean professor of divinity at Cambridge, and dean of Exeter, he was appointed bishop of Gloucester and Bristol in 1863, retaining the former see after the disjunction of Bristol in 1897. He was for eleven years chairman of the scholars engaged on the revision of the New Testament translation, and has published commentaries on the Old and the New Testament, as well as numerous sermons, addresses, lectures, &c. He has also issued: *Modern Unbelief, its Principles and Characteristics* (1877); *Some Present Dangers to the Church of England* (1878); and *Spiritual Needs in Country Parishes* (1888).

ELLIS, ALEXANDER JOHN, scientist and philologist, was born at Hoxton on June 14, 1814. He was educated at Shrewsbury, Eton, and Trinity College, Cambridge, where he graduated in 1837 as sixth wrangler, with first place in the second class of the classical tripos. He thenceforth devoted himself to mathematics, the scientific side of music, and more especially to philology and phonetics. He was elected F.R.S. in 1864, was twice president of the Philological Society, and a few months before his death, on October 28, 1890, was gratified by the conferment on him by his old university of the degree of Doctor of Letters. His translation of Professor Helmholtz's *Sensations of Tone* (1875) has taken a place as a standard work on scientific music. But phonetics was his study *par excellence*. In 1848 he published two small works, *The Essentials of Phonetics*; and *A Plea for Phonetic Spelling*, and collaborated with the late Sir Isaac Pitman in framing a phonetic system. His *magnum opus* on Early English Pronunciation, with special reference to Chaucer and Shakespeare, appeared in five parts between 1869 and 1889.

ELLIS, ROBINSON, Latin scholar, was born at Barming, Kent, on Sept. 5, 1834. He was educated in Guernsey and at Rugby School, then proceeded to Balliol College, Oxford, where he greatly distinguished himself as a classical scholar. In 1858 he was elected a fellow of Trinity College, Oxford, and in 1870 he became professor of Latin in University College, London. From 1883 till 1893 he was University Reader in Latin Literature at Oxford, and in the latter year he was elected to the Corpus Professorship of Latin, which is conjoined with a college fellowship. His name is chiefly associated with the elucidation of the poems of the Roman poet Catullus. In 1867 he published a critical edition of Catullus (*Catulli Veronensis Liber*), and in 1871 *The Poems and Fragments of Catullus in the metres of the original*, these works being followed by a *Commentary on Catullus* (1876). Other publications of his include *Ovid's Ibis*, with *Commentary* (1881); *Fables of Avianus* (1887); *Noctes Manilianae* (1891); *The Fables of Phaedrus* (1894); and a new edition of *Velleius Paterculus*, with commentary. Professor Ellis has also contributed many articles on subjects connected with Latin literature to various philological journals and magazines.

ELLIS, WILLIAM, English missionary, was born in London on Aug. 29, 1794, and died on June 9, 1872. He was sent out to the South Sea Islands in 1816 by the London Missionary Society, and returned in 1825, one result of his labours being *Polynesian Researches* (1829). In 1830-44 he was secretary to the society, and afterwards on its behalf made several visits to Madagascar, the longest being in 1861-65. These visits led him to publish: *Three Visits to Madagascar* (1858); *Madagascar Revisited* (1867); and the *Martyr Church of Madagascar* (1870). His second wife, Sarah Stickney, married in 1837, wrote several popular works, in-

cluding: *The Women of England* (1838); *The Daughters of England* (1842); *The Wives of England* (1843); and *The Mothers of Great Men* (1859). She died about a week after her husband.

ELLORR, a town of India, in the Godavari district of the Madras presidency, on the river Tammalar, once the capital of the Northern Circars. It has magisterial and judicial establishments, police-station, post-office, &c., a mission of the Church Missionary Society, Roman Catholic mission and garrison; some manufactures of carpets and saltpetre. Pop. (1891), 29,382.

ELMIRA, a city of the United States, capital of Chemung county, in the state of New York, on the Chemung river. It is the largest trading centre in that part of the state (264 miles north-west of New York city by rail), and its varied industries include the manufacturing shops of the Pullman Car Company, and the Erie and North Central Railways. It has also a large number of boot and shoe factories, several iron-foundries, a woollen mill, &c. There is a state reformatory and a well-endowed college (Elmira College), which was originally founded as a female college in 1852. Pop. (1900), 35,672.

ELSWICK, a western suburb of Newcastle, England, containing the great ordnance works of Sir William Armstrong, Mitchell, and Co. These works are probably the largest of their kind in Europe, and employ about 14,000 persons. Pop. 51,000. See ARMSTRONG, LORD, in SUPP.

ELTON, CHARLES ISAAC, jurist and archaeologist, was born in Somersetshire in 1839, and received his education at Cheltenham College and Balliol College, Oxford. He became Fellow of Queen's College in 1862, and was three years later called to the bar, becoming Q.C. in 1885 and a Bencher of Lincoln's Inn in 1887. Early in life he inherited a good estate in Somersetshire, so that, though practising at the bar, he did not require to depend upon his profession. He represented West Somerset in Parliament as a Conservative on two occasions, namely, 1884-85 and 1886-92. On legal subjects we have from his pen: *Tenures of Kent* (1867); *Commons and Waste Lands* (1868); *Copyholds and Customary Tenures* (1874, 1893); *Improvement of Commons Bill* (1876); *Custom and Tenant-Right* (1882); and *Robinson on Gavelkind* (1897). Among works that appeal more to the general public he has produced: *Norway, The Road and Fell* (1864); *The Career of Columbus* (1892); *The Great Book-Collectors* (1893); and *Shelley's Visits to France* (1894). His greatest work, however, is his *Origins of English History* (1882; 2nd ed., 1890), in which he traces the development of England and its inhabitants from the earliest times of which we have any knowledge to the time when Christianity was accepted by the conquering Anglo-Saxons. It is chiefly characterized by its thorough investigation of the evidence furnished by Greek and Roman writers regarding the condition of early Britain, by its discussion of the ethnology and prehistoric archaeology of the country, and by the importance assigned to the Celtic and even pre-Celtic element in forming the English nation. He died at Chard on April 23, 1900.

EMBOLISM, the blocking up of a blood-vessel by a clot of blood that comes from some distance till it reaches a vessel too small to permit its onward progress. This is often the cause of sudden paralysis and death, or of gangrene and pyæmia. See THROMBOSIS in SUPP.

EMESA, an ancient town, now called Hama (which see).

EMMENAGOGUES, medicines tending to promote menstruation, such as aloes with myrrh, &c.

EMPHYSEMA, in medicine, an inflation of

some part of the body by the introduction of air into the cellular tissue, as from an injury to the trachea or lungs. The name is also given to a condition of the lungs when the air-cells are unduly distended and their walls have lost their natural elasticity. It may be a result of bronchitis or other disease, and is characterized by shortness of breath.

EMPLOYER'S LIABILITY. By an act of Parliament passed in 1880 a workman (the word being understood with certain limitations) can claim compensation for injuries received in his employer's service, and in the event of the injured man's death his relatives or representatives can prosecute the claim by legal process if necessary. Under this act the employer becomes liable when the injury is caused by any negligence on his own part to take reasonable precautions in providing and keeping in repair all machinery, &c., necessary to the work. The employer is also liable when the injury has been caused by the incompetence or negligence of anyone to whom he has delegated his authority, such as a foreman or manager, or anyone in charge of railway signals, points, &c. The employer, however, is not liable when the workman has received his injuries by his own incompetence or carelessness; neither is he liable when the injury is caused by the fault of another workman in his employment; neither is there any compensation allowable when the workman has entered into an agreement not to put forward a claim under the act. In claiming compensation by legal process the action must be brought within six months of the accident, or twelve months of the death, and notice of the injury received must be given to the employer within six weeks. When compensation is allowed the act provides that it shall not exceed the equivalent of three years' earnings by the injured workman. In the event of a *stranger* being injured by a workman in the usual course of his work, the employer is liable; but when the act by which the injury has been done is a thing forbidden, or when the workman brings about the damage wilfully or maliciously, then the employer is not responsible. The law of employer's liability was amended in some important particulars by the Workmen's Compensation Act of 1897 (60 and 61 Vict., cap. xxxvii.). This act applies to work on, in, or about a railway, quarry, mine, factory, or engineering work, or a building of not less than 30 feet high, being constructed or repaired by means of scaffolding, or being demolished, or on which machinery driven by mechanical power is used for such purposes. It applies to work under the government, except in the army and navy, and does not apply to sailors, agricultural labourers, domestic servants, &c. The onus of proving non-liability is laid on the employer, the presumption being in favour of the injured or deceased workman. The employer is not liable in respect of injuries which do not disable the workman for at least two weeks from earning full wages. The amount of compensation in case of death to be paid to a workman's dependants varies with the extent of their dependence, and in cases of partial dependence it is determined in accordance with the act by arbiters; in no case, however, shall it amount to over £300. In cases of disablement the employer is liable to a weekly payment equivalent to one-half of the workman's average weekly wages during the year preceding the accident, or if he has not been with the employer for a year, during the term of his employment; but this payment shall never exceed £1 per week, and may be commuted after a time. With regard to the much-discussed 'contracting-out', the Act of 1897 provides that special insurance agreements shall be allowed to supersede its provisions

only when the Registrar of Friendly Societies has certified that they are not less favourable to the workmen than the terms under the act. It also provides that the acceptance of such agreements must not be made a condition of hiring, and that the Registrar may give a certificate to hold good for five years unless revoked through unfair management. The act came into force on the 1st of July, 1898, and in 1900 its operation was extended to agricultural labourers.

EMPYEMA, in medicine, a collection of pus or morbid matter in some cavity of the body, especially in the cavity of the pleura or chest, a not uncommon result of pleurisy. See **PLEURISY**.

ENCEPHALITIS, inflammation of the brain. See **BRAIN**.

ENCEPHALON, a term for the brain and whole nervous mass included in the skull. See **BRAIN**.

ENCHANTER'S NIGHTSHADE, a name common to plants of the genus *Circæa*, belonging to the order Onagraceæ, of which there are two British species, *C. lutetiana* and *C. alpina*. The former is about a foot and a half high, and has delicate ovate leaves, small white flowers tinged with pink, and small roundish seed-vessels covered with hooked bristles. It abounds in shady woods. *C. alpina*, which is similar, but smaller and more delicate, is found in Scotland and the north of England. They have no affinity with the nightshades.

ENCORINITE, a name often applied to all the marine animals of the order Crinoidea or stone-lilies, class Echinodermata, but more specifically restricted to the genera having rounded, smooth stems attached to the bottom, and supporting the body of the animal, which has numerous jointed arms radiating from a central disc, in which the mouth is situated. Encorinites were exceedingly numerous in past ages of the world's history; of those still existing our knowledge has been greatly increased of recent years through deep-sea dredging. Some of these forms are very graceful and interesting. See also **ECHINODERMATA**.

ENDOCARDITIS, the inflammation of the endocardium, or serous membrane lining the valves and internal surface of the heart. See **HEART**.

ENEMA, any liquid or gaseous form of medicine for injection into the rectum. It is most commonly administered to induce peristaltic action of the bowels, but it is often the most desirable means of conveying into the system nourishment or stimulants. See **CLYSTERS**.

ENGLISH BAZAR, or **ANGREZABAD**, a town of Bengal, head-quarters of Malda district, on the Mahānandā. It is situated in a district where the mulberry is extensively cultivated, and it has a trade in grain. Pop. (1891), 13,818.

ENGLISH CHURCH, LANGUAGE, LITERATURE, &c. See **ENGLAND**.

ENNA. See **CASTRO-GIOVANNI**.

ENSENADA (in Spanish, a creek, cove, or bay), a seaport of the Argentine Republic, province of Buenos Ayres, the port of the town of La Plata, with which it is connected by rail and tramway. The harbour works are of quite recent construction. Another **ENSENADA** is a rising seaport of Mexico, in the northern part of Lower California, on the Pacific coast in the bay of Todos los Santos. Besides agriculture, stock-rearing, wine-growing, &c., there has recently been a great increase in mining operations, the district being rich in gold and copper. Many of the population are natives of the United States.

ENTELLUS, an East Indian species of monkey, of the genus *Semnopithecus* (*S. entellus*). It has yellowish fur, with a face of a violet tinge, and a long and powerful tail, which, however, is not pre-

hensile. It receives divine honours from the natives of India, by whom it is termed *Hooman*. Costly temples are dedicated to these animals; hospitals are built for their reception, and large fortunes are bequeathed for their support. The entellus abounds in India, enters the houses and gardens of the natives, plunders them of fruit and estates, and the visit is even considered an honour. See *HANUMAN*.

ENTERIC FEVER. See *TYPHOID FEVER*.

ENTRESOL (Fr. 'between the floors'), a low story between two of greater height, generally the ground and first stories. It is called also the *Mezzanine*.

ENVELOPE, the paper cover that incloses a letter or note. They became common shortly after the introduction of the penny postage system, and were at first made chiefly by hand, but are now not only shaped, but folded, gummed, &c., by machinery. In the first instance the paper is cut into large lozenge-shaped sheets, which are then cut by means of steam-worked dies into what are called *blanks*, that is, pieces of the size and shape of the unfolded envelope. These are then arranged in piles on the front of a self-feeding envelope-machine, and as each blank is brought by an automatic feeder on to the top of a frame a plunger descends on it and marks the impression of the rectangular portion, the flaps thus becoming turned up. These are then folded down by mechanical fingers, and as during the process they have been gummed in the proper places, the envelope is then complete save for the drying process, which is effected without discontinuity by means of an endless chain. Such a process can turn out about ninety envelopes per minute.

ENVOY. See *MINISTERS (FOREIGN)*.

EPACRIS, a genus of monopetalous dicotyledonous plants, the typical genus of the natural order Epacridaceae, distinguished by having a coloured calyx with many bracts, a tubular corolla with smooth limb, stamens affixed to the corolla, and a five-valved many-seeded capsule. The species are shrubby plants, with axillary, white, red, or purple flowers, generally in leafy spikes. Among those cultivated in Britain we may mention *E. grandiflora*, which has flowers nearly an inch in length, of a brilliant reddish purple at the base and pure white at the apex. The order Epacridaceae consists of plants allied to the heaths, chiefly natives of Australia. The fruit of some species is eaten under the name of Australian cranberry, and they are cultivated in greenhouses for their flowers.

EPIDAMNUS. See *DURAZZO*.

EPIDENDRUM (Gr. *epi*, upon, and *dendron*, a tree), a large genus of tropical American orchids, most of the species of which are epiphytic, growing on trees. There are upwards of 300 species. The stems are often pseudo-bulbs, the leaves are strap-shaped and leathery, and the flowers are single or in spikes, panicles, or racemes. The flowers are very handsome, and a large number of the species are in cultivation. Two of the finest cultivated species are the Mexican plants, *E. nemorale* and *E. vitellinum*, the former with rose- and the latter with orange-coloured flowers.

EPILOBIUM, the willow-herb, a genus of plants belonging to the natural order Onagraceae. The species are herbs or under-shrubs with pink or purple, rarely yellow, flowers, solitary in the axils of the leaves or in terminal leafy spikes. The seeds are tipped with a pencil of silky hairs, and are contained in a long four-celled capsule. There are more than fifty species scattered over the arctic and temperate regions of the world, ten of them being natives of Britain. *E. hirsutum*, or Collins-and-cream, is a common and conspicuous plant of the river- and stream-side. Its flowers are pink and

rather large, and the whole plant is very downy. *E. angustifolium* is sometimes found wild, but is oftener seen in cottage gardens.

EPISTAXIS, in medicine, a name for bleeding at the nose. See *NOSE*.

EPITHELIOMA, epithelial cancer. See *CANCER*.

EPITHELIUM, in anatomy, the cellular layer which lines the internal cavities and canals of the body, both closed and open, as the mouth, nose, respiratory organs, blood-vessels, &c., and which is analogous to the cuticle of the outer surface. There are several varieties of epithelium, each being usually adapted for a special purpose. When the epithelial cells are intended to serve mainly as a protective covering, they are usually of a scaly character and disposed in a single layer. Such an epithelium is found surrounding the heart and veins and the serous membranes. When, however, it is intended to take an active part in the process of secretion, in parts of the intestines, the cells assume a columnar form, and for a still greater degree of activity they are of a globular character. In some parts of the body ciliated epithelial cells are found. In the eye, mouth, &c., the cells of the epithelium are disposed in several layers, and in other portions of the body we find a kind of arrangement of the cells intermediate between the one-layer and several-layer system. The epithelium lining the blood-vessels is called sometimes *endothelium*.

EPIZOA, a term applied to those parasitic animals which live upon the bodies of other animals, as lice, the itch-insect, &c. See *PARASITES*, *LOUSE*, *FLEA*, &c.

EPIZOÖTIC, or *EPIZOÖTIC DISEASE*, a disease that at some particular time and place attacks great numbers of the lower animals just as an epidemic attacks man. Pleuro-pneumonia is often an epizootic, as was also the rinderpest.

EPWORTH, a small market-town of North Lincolnshire, 12 miles in a northerly direction from Gainsborough. It is noteworthy as the birthplace of John Wesley, the founder of Methodism. Pop. 1900.

ERCKMANN-CHATRIAN, the combined surnames of two Frenchmen, natives of Alsace, who collaborated in writing romances. Emile Erckmann was born at Phalsbourg on 20th May, 1822, and having completed his studies in the communal college of his native town, he went to Paris in 1842 to study law. Returning to Phalsbourg in 1847 because of a serious illness, he began to turn his attention to romance writing during his convalescence. It was about this time (1848) that he met his collaborateur. Alexandre Chatrian was born in the village of Soldatenthal on the 18th December, 1828. His father was a glass-blower, and it was intended that he should follow the same craft. Instead of doing so, however, he left his native village and became a teacher in Phalsbourg, where he made the acquaintance of Erckmann. For a number of years the stories produced by this curious copartnership were published in obscure newspapers both in Straßburg and Paris, but about 1860 their graphic romances of eastern France in the time of Napoleon I. gained a rapid popularity. Their success was continued in a series of which the best-known are: *Le Fou Yégo* (1862); *L'ami Fritz* (1864); *Histoire d'un Conscrit de 1813* (1864); *Waterloo* (1865); *Le Blocus* (1867); *Histoire d'un Payan* (1868); and *Contes Populaires*. They also published three plays—*Le Juif Polonais* (known in its English adaptation as *The Ball*), a dramatized version of *L'ami Fritz*, and *Les Rantzau*. When the two friends met they elaborated the scheme of a work; then Erckmann wrote it. Chatrian corrected it, and sometimes put it in the fire. Erckmann would even be required by

his friend to write his story over three times. Latterly the two friends disagreed, and the world received no more of their minute transcripts from the daily life of the Alsatian peasant. Alexandre Chatrian died on the 4th September, 1890; Erkmann on 18th March, 1899.

ERDMANN, JOHANN EDUARD, German philosopher, was born at Wolmar, in Livonia, on June 13, 1806. He studied theology at the Universities of Dorpat and Berlin, where he was particularly attracted by Hegel. In 1829 he became a clergyman in his native town, but in 1832 returned to Berlin and took his degree in the department of philosophy. In 1836 he became professor extraordinary of philosophy at the University of Halle, being appointed ordinary professor in 1839. He died on 12th June, 1892. He wrote numerous philosophical works, characterized for the most part by their Hegelian tendencies. Of these some of the chief are: *Body and Soul*, *Nature and Creation*, *Outlines of Psychology*, *Outlines of Logic and Metaphysics*, *Psychological Letters*, *Belief and Knowledge*, &c. His greatest work, however, is his *Outlines of the History of Philosophy*, of which an English translation has appeared under the editorship of Dr. Hough (3 vols., 1889).

ERICA, the heath, a large genus of branched rigid shrubs, type of the natural order Ericaceae, most of which are natives of South Africa, a few being found in Europe and Asia. The leaves are narrow and rigid, the flowers are globose or tubular, and four-lobed. Five species are found in Britain. See **HEATH**.

ERICHSEN, SIR JOHN ERIC, surgeon, was born on July 19, 1818, his father being a Copenhagen merchant. He spent nearly all his life in England; studied at University College, London, became a member of the Royal College of Surgeons in 1839, a Fellow in 1845, and in 1850 Professor of Surgery and Hospital Surgeon at University College. In 1865 he succeeded Quain as Professor of Clinical Surgery in the same college, a post which he held till his retirement in 1875. He was appointed President of University College in 1887, and held that post till his death at Folkestone on Sept. 23, 1896. Sir John was a Fellow of the Royal Society and of various foreign learned bodies, and an ex-president of the Royal College of Surgeons and other surgical societies. In 1875 he served on the Royal Commission on Vivisection, and latterly he was chief Surgeon-extraordinary to the Queen. In 1885 he stood unsuccessfully as a candidate for the parliamentary representation of Edinburgh and St. Andrews Universities in the Liberal interest. His most important work was his *Science and Art of Surgery* (1853), which has gone through many editions, and has been translated into several languages. He also published a volume on *Concussion of the Spine* (1875). He received the honour of a baronetcy in 1895.

ERIKSSON, JOHN, engineer, was born in Sweden in 1803. He served for a time in the Swedish army; removed to London in 1826, and to New York in 1839. He is identified with numerous inventions and improvements on steam machinery and its applications. His chief inventions are his *caloric engine*, the *screw propeller* (1836), which has revolutionized navigation, and his *turret-ships*, the first of which, the *Monitor*, distinguished itself in the American civil war, and inaugurated a new era in naval warfare. He latterly devoted himself to studies of the earth's motion and the intensity of solar heat. He died in New York on March 8, 1899. In 1890 a *Life* by W. C. Church was published in two volumes.

ERIE CANAL, the largest in the United States,

serving to connect the great lakes with the sea. It begins at Buffalo on Lake Erie, and extends to the Hudson at Albany. It is 363 miles long; has in all 72 locks; surface width 70 feet, bottom width 42 feet, and depth 7 feet. It is carried over several large streams on stone aqueducts; cost nearly £2,000,000, and was opened in 1825. The navigation is free.

ERIODENDRON, the wool-tree, a genus of plants belonging to the natural order Malvaceae (mallows). There are eight species natives of America, but one belongs to Asia and Africa. The species are noble plants, growing from 50 to 100 feet high, having palmate leaves, and red or white flowers. The woolly coat of the seeds of some of the species is used in different countries for stuffing cushions and similar purposes.

ERITREA, or **ERTHREA** (from Greek *erythros*, red, referring to the Red Sea), the official name of an Italian colonial possession stretching along the African shore of the Red Sea from Cape Kasar in 18° 2' N. lat. to the Sultanate of Raheita on Bab-el-Mandeb in 12° 30' N. The coast-line is between 650 and 700 miles in length, and the area of the colony is about 88,500 sq. miles. Pop., largely nomadic, about 600,000. The chief town is Massowah.

ERRATICS, or **ERRATIC BLOCKS**, in geology, boulders or large masses of angular rock which have been transported to a distance from their original mountains by the action of ice during the glacial period. Thus, on the slopes of the Jura Mountains immense blocks of granite are found which have travelled 60 miles from their original situation. Similarly masses of Scotch and Lake-district granites and of Welsh rocks (some of which weigh several tons) occur not uncommonly in the surface soil of the Midland counties of England. See **GEOLOGY**.

ERYSIMUM, a genus of plants of the natural order Cruciferae, chiefly biennials, with narrow entire leaves, and yellow, often fragrant, flowers. There are about 100 species, natives of northern temperate and cold countries. *E. cheiranthoides*, a native of Europe and North America, is found in waste places in the south of England, and, from being used as an anthelmintic, is called worm-seed.

ERYTHEMA, a mild form of inflammation of the skin somewhat resembling erysipelas. This disease consists usually in a redness of parts of the skin with or without elevation, and several varieties are commonly distinguished. Some forms are connected with constitutional diseases, as rheumatism, gout, &c.

ESBJERG, or **ESBERG**, a North Sea port of Denmark, on the south-west coast of Jutland, in the province of Ribe, opposite the island Fanø. It is a place of rapidly-increasing importance, being now second only to Copenhagen as a seaport, though of quite recent origin. It carries on a large trade with Grimsby, Newcastle, Parkston (near Harwich), &c., in England, and with various Continental ports, the chief exports being pork and meat, butter, eggs, fish, cattle, &c., and the chief imports corn, artificial manures, coal and coke, salt, oil, pig-iron, cement, oil-cake, &c. The harbour has been much improved in recent years, at the expense of the state, by the construction of large breakwaters, piers, &c. Pop. in 1875, 1006; 1897, 12,511.

ESCALOP-SHELLS. See **PROTHES**.

ESCHSCHOLTZIA, a small genus of glabrous whitish plants, of the poppy order (Papaveraceae), natives of California and the neighbouring regions. They have divided leaves, and yellow peduncled flowers. The sepals cohere and fall off in the form of a calyptra as the flower opens. They are now common in the gardens of Great Britain.

ESERIN, or **PHYOSTIGMIN**, a drug obtained from Calabar-bean, the active principle of this plant, used as a remedy in cases of tetanus (lock-jaw). A solution of eserin dropped in the eye causes contraction of the pupil, and hence its use in some eye ailments, as, for instance, glaucoma.

ESKI-JUMNA, town of Bulgaria, on the northern slope of Binar-Dagh, 20 miles w.s.w. of Shumla. Pop. (1898), 8946.

ESKILSTUNA, a town of Sweden, on a river of the same name connecting Lake Maelar with Lake Hjelmar. It has iron-works and manufactures of steel goods, weapons, &c., and is known as the Sheffield of Sweden. Pop. (1896), 12,576.

ESKI-SHEHR, a town of Asiatic Turkey, 90 miles s.e. of the Sea of Marmora, with warm baths and manufactures of meerschaum pipes from the deposits of that substance in the neighbourhood. Pop. 10,000.

ESQUIROS, **HENRI FRANÇOIS ALPHONSE**, French poet, romancier, and miscellaneous writer, was born at Paris on May 23, 1814, and died at Versailles on May 12, 1876. His first work, a volume of poetry, *Les Hirondelles*, appeared in 1834. This was followed by numerous romances, and a socialistic commentary on the Life of Christ: *L'Évangile du Peuple* (1840), for which he was prosecuted and imprisoned. He then published *Les Chants d'un Prisonnier* (1841), poems written in prison; *Les Vierges Folles* (1842); *Les Vierges Sages* (1842); *L'Histoire des Montagnards* (1847); &c. Having to leave France in 1851 he resided for years in England, and wrote a series of essays for the *Revue des Deux Mondes* on English life and character, which were translated under the title of *The English at Home*, and were very popular. He also wrote a similar work on the Dutch. He was elected to the chamber at various times, where he voted with the extreme left, and about a year before his death he became a member of the Senate. Some other works from his pen are *Le Droit au Travail* (1849); *Histoire des Martyrs de la Liberté* (1851); *La Morale Universelle* (1859); *Les Paysans* (1877); and *Le Château Enchanté* (1877), a novel.

ESSAYS AND REVIEWS, a volume written by six Church of England clergymen and one layman, viz. Dr. Temple (afterwards successively Bishop of Exeter and London and Archbishop of Canterbury), Dr. Rowland Williams, Professor Baden Powell, H. B. Wilson, Mark Pattison, Prof. Jowett, and Mr. C. W. Goodwin, and published in March, 1860. The articles were the following, arranged in the order of their authors given above: *The Education of the World*, Bunsen's Biblical Researches, *The Study of the Evidences of Christianity*, *The National Church*, *Tendencies of Religious Thought in England, 1688-1750*, *The Interpretation of Scripture*, and *the Mosaic Cosmogony*. Its alleged heterodoxy caused much excitement, and called forth numerous replies, condemnation by convocation in 1864, and the prosecution of two of the writers, Dr. Williams and Mr. Wilson, before the ecclesiastical courts.

ESSENCES, solutions of the volatile or essential oils in spirits. See **OILS (ESSENTIAL)**.

ESTABLISHED CHURCH. See **RELIGION (ESTABLISHED)**.

ESTIVATION. See **RESTITUTION**.

ETHYLENE. See **OLEFANT GAS**.

EUCHRE, a game at cards, very popular in America. The pack consists of thirty-two cards, the low cards from two to six being thrown out. It may be played with two, three, or four players. The cards rank as at whist, with the exception that the knave of the suit turned up as trumps, called the *right*

bower, is the highest card, and the knave of the other suit of the same colour, called the *left bower*, ranks as a trump, and is the second highest. (The word *bower*, it may be remarked, is from Ger. *bauer*, a peasant, also the knave at cards.) After cutting for the deal five cards are dealt to each player, either two at a time, and then three, or else three at a time and then two, and then a card for trump is turned up on the top of the pack. The cards are played as in whist, and the player may either take or pass the trick, but must not revoke. A trick consists of one round, however many play. It is at the option of the player whose turn it is to commence play after the deal either to play or pass. If he elects to play and wins five tricks he counts two; if he wins three tricks he counts one; if he wins fewer than three tricks he is *cuchred*, and each independent opponent counts two. When two play, the non-dealer has the option of playing first. If he is willing to play he says 'Order it up'. The dealer then places a card under the pack, and when it is his turn to play takes up the trump card. If the non-dealer is unwilling to play he says 'Pass'. The dealer may then either take up the trump card, putting one down in place of it as before, and play, or he may pass in turn. If he passes, he *turns down* the trump card, placing it face upwards, half-way under the other cards of the pack. The non-dealer has now the option of making any other suit trumps and beginning to play; if he passes again, the dealer may make. If both decline to make, the cards are thrown up and dealt again by the other player. When three play, each plays for himself; when four, they play as partners. The game is five up.

EUONYMUS, the spindle-tree or prick-wood, a genus of shrubs or trees, belonging to the natural order Celastrineæ, containing about fifty species, natives of the temperate regions of the northern hemisphere. See **SPINDLE-TREE**.

EUPHONIUM, a brass base instrument, generally introduced into military bands, and frequently met with in the orchestra as a substitute for the bass trombone, from which, however, it is very different in tone. It is tuned on C or on B flat, and is furnished with three or four valves or pistons.

EUPHRATES VALLEY RAILWAY, a projected railway from the Mediterranean coast of Asiatic Turkey to the Euphrates valley and Persian Gulf. Projects for shortening the journey to India by the construction of a railway in the Euphrates valley have been repeatedly discussed, and some such expeditious method of reinforcing the British troops in India has been regarded as highly desirable. The schemes spoken of have been various, but the original project was to connect the Bosphorus with the Persian Gulf. Recently an agreement has been made between the Turkish government and the German company controlling the Anatolian Railway from the Bosphorus to Konia, whereby this railway is to be continued to Bagdad and Basorah. There is already a line from Smyrna joining the line to Konia, and this would furnish a shorter thoroughfare.

EUSTACHIAN TUBE, in anatomy, a canal leading from the pharynx to the tympanum of the ear. See **EAR**.

EVANS, **SIR JOHN**, archaeologist, was born at Britwell Court on Nov. 17, 1823, and educated at Market Bosworth School, Leicestershire. For some time he was an active member of a firm of paper-manufacturers, but latterly turned his attention chiefly to scientific subjects. His publications include: *The Coins of the Ancient Britons* (1864, supplement 1890); *The Ancient Stone Implements, Weapons, and Ornaments of Great Britain and Ireland* (1872, 2nd and enlarged edition 1897); and

the Ancient Bronze Implements, Weapons, and Ornaments of Great Britain and Ireland (1881). From 1878 till 1896 Sir John Evans was Treasurer of the Royal Society, and he presided over the Toronto meeting of the British Association in 1897. He has also been President of the Geological Society (1874-76), of the Numismatic Society (1874-96), and of the Society of Antiquaries (1885-92), and he is a corresponding member of the Institute of France. His great work on stone implements received a prize from the French Academy, and both it and his other work on bronze implements were translated and published in Paris shortly after they appeared in England. He was created a Knight Commander of the Bath in 1892.—His eldest son, ARTHUR JOHN, born in 1851, educated at Harrow, Oxford, and Göttingen, has distinguished himself as traveller and archaeologist, has in particular made important archaeological investigations and discoveries in Crete, and has been since 1884 keeper of the Ashmolean Museum, Oxford. He has published *Through Bosnia and Herzegovina on Foot during the Insurrection*, August and September, 1875: with an Historical Review of Bosnia, and a Glimpse at the Croats, Slavonians, and the Ancient Republic of Ragusa (1876); *Illyrian Letters*, originally addressed to the *Manchester Guardian* (1878); *The Slavs and European Civilisation: a Lecture* (1878); *The 'Horsemen' of Tarentum* (1889); *Syracusan Medallions and their Engravers* (1892); *Cretan Photographs* (1896); &c.

EVENING-PRIMROSE, *Enothera*, a genus of plants of the natural order Onagraceæ. *E. biennis*, an American species common in cottage gardens, is not unfrequent as an escaped plant in England. See ONAGRACEÆ.

EVENING-STAR, or **HESPERUS**, the name given to the planet Venus when visible in the evening. See VENUS.

EVIDENCES OF CHRISTIANITY. These may be divided broadly into two great classes, viz. *external evidences*, or the body of historical testimonies to the Christian revelation; and *internal evidences*, or arguments drawn from the nature of Christianity itself as exhibited in its teachings and effects, in favour of its divine origin. The first Christian apologies—those of Justin Martyr, Minucius Felix, and Tertullian, written in the second century—were mainly intended as justifications of the Christian religion against the charges of atheism, immorality, &c., commonly made at that time. Of a more philosophical kind, and dealing more comprehensively with the principles of religion and belief in general, are the works of Origen, Arnobius, and Augustine in the centuries immediately succeeding. During the middle ages, the scientific representation of Christianity is mostly the work of the schoolmen occupied in welding Aristotelian or Platonic philosophy with the fabric of Christian dogmatics, or writing attacks on the Jewish and Mahomedan faiths. In the sixteenth and seventeenth centuries the influences of the Renaissance and the Reformation gave rise to a spirit of inquiry and criticism which developed English deism as represented by Herbert and Hobbes in the seventeenth century, and Collins and Bolingbroke in the eighteenth. The general position of English deism was the acceptance of the belief in the existence of God, and the profession of natural religion, along with opposition to the mysteries and special claims of Christianity. It was in confutation of this position that the great English works on the evidences of Christianity by Butler, Berkeley, and Oudworth were written. In France the new spirit of inquiry was represented by Diderot, D'Holbach, and the encyclopedists in general, who assailed Christianity mainly on the ground that it

was founded on imposture and superstition, and maintained by sacerdotal trickery and hypocrisy. No reply of any great value was produced in the French church, although in the previous age Pascal in his *Pensées* had brought together some of the profoundest considerations yet offered in favour of revealed religion. The nineteenth century has been distinguished by the strongly rationalistic spirit of its criticism. The works of such writers as Strauss, Bauer, and Feuerbach, attempting to eliminate the supernatural and the mysterious in the origin of Christianity, have been answered by the works of Neander, Ebrard, Ullmann, &c., on the other side. The historical method of investigation, represented alike by the Hegelian school and the Positivists in philosophy, and by the Evolutionists in science, is the basis of the chief attacks of the present time against the supernatural character of Christianity, the tendency of all being to hold that while Christianity is the highest and most perfect development to which the religious spirit has yet attained, it differs simply in degree of development from any other religion. Notable amongst later apologists of Christianity have been Paley (*Natural Theology*), Chalmers (*Natural Theology*), Mansel, Liddon, and others, Lecturers of the Bampton Foundation; in Germany, Luthardt, Ewald, Baumstark, &c.

EWALD, GEORG HEINRICH AUGUST, a celebrated orientalist and biblical critic, was born at Göttingen, 16th November, 1803, where he attended the gymnasium, and after Easter, 1820, the university, his studies at the latter taking a decided turn in the direction of oriental languages. As a student he published his first critical work, *Die Composition der Genesis*. After acting for a short time as a teacher in the gymnasium of Wolfenbüttel he returned to Göttingen as a theological tutor, and in 1827 was appointed extraordinary, in 1831 ordinary professor of theology, and in 1836 professor of oriental languages. In 1826, 1829, and 1836 he made journeys to Berlin, Paris, and Italy, for the purpose of studying oriental manuscripts. As one of the seven professors of Göttingen who signed the protest against the abrogation by King Ernest Augustus of the Hanoverian constitution, he lost his chair, and after a journey to England for the study of manuscripts he accepted, in 1838, a call as professor of philosophy to Tübingen. Three years later he became professor of theology. Here the controversies between Roman Catholics, New Pietists, and Hegelians led him into frequent controversial writing. He returned in 1848 to Göttingen, resumed his old chair, and here he spent the remainder of his life. When Hanover was annexed by Prussia in 1866 he became a zealous defender of the rights of the ex-king, and this led to his removal from his university chair, though his salary was continued. He was elected several times a member of the diet, where he spoke strongly in favour of the restoration of the Hanoverian monarchy. He died at Göttingen, 4th May, 1875. His *Kritische Grammatik der hebräischen Sprache* (*Critical Grammar of the Hebrew Language*), Leipzig, 1827, afterwards merged in his *Ausführliches Lehrbuch der hebräischen Sprache*, and continually enlarged (8th edition, 1870), formed an epoch in the study of Hebrew, and placed Ewald in the first rank among scholars. *Das Hobe Lied Salomos* (*The Song of Solomon*); *Die poetischen Bücher des Alten Bundes* (*The Poetical Books of the Old Testament*), four vols.; *Die Propheten des Alten Bundes*, containing a translation and interpretation of all the prophets in chronological order; together with his *Geschichte des Volks Israel* (*History of the People of Israel*), seven vols.; and *Die Alterthümer des Volks Israel*

(The Antiquities of the People of Israel), three vols., are his principal works on the Old Testament. The History of Israel is considered his greatest work, and, like others of his more important writings, has been translated into English. On the New Testament he wrote, among other works, *Uebersetzung und Erklärung aller Bücher des Neuen Testaments* (Translation and Explanation of all the Books of the New Testament). Another important work is his *Die Lehre der Bibel von Gott oder Theologie des Alten und Neuen Bundes* (the Doctrine of the Bible regarding God, or Theology of the Old and New Testaments). He also wrote philological treatises on various eastern languages, and on subjects connected with them, among which may be mentioned works on the Book of Enoch, on Phœnician inscriptions, on Phœnician views regarding the creation of the world, on Arabic Grammar, and Linguistic Studies. From 1849 to 1865 he issued a serial almost entirely written by himself, called *Die Jahrbücher der biblischen Wissenschaft* (Year Books of Biblical Science).

EWART, JAMES COSSAR, zoologist and authority on fish-culture, was born at Penicuik, Midlothian, on Nov. 26, 1851. He studied medicine at Edinburgh University, graduated with honours in 1874, and was appointed the same year Demonstrator in Anatomy in the university. From 1875 till 1878 he was Conservator of the University College Museum, London, and in the latter year he took his M.D. degree, being awarded a gold medal for his thesis. During the succeeding four years he held the position of Professor of Natural History in Aberdeen University. Since 1882 he has held the corresponding post in his *alma mater*. In 1879 he started a marine station at Aberdeen, where he worked along with the late Professor Romanes on the Echinodermata, and since his transference to Edinburgh, and appointment to the Fishery Board in 1882, with which he was connected for about ten years, he has devoted much attention to the question of fish-culture and preservation. In order to get opportunities for full investigation into this important subject he has visited North America, Denmark, and Norway. He has also carried out experiments in the hybridization of zebras and horses. Many important works have come from his pen, amongst which we may mention: *The Locomotor System of the Echinoderms* (with G. J. Romanes, 1881); *The Natural and Artificial Fertilization of Herring Ova* (1884); *On the Progress of Fish Culture in America* (1884); *On Whitebait* (1886); *On the Preservation of Fish* (1887); *The Electric Organ of the Skate* (1888-89); *The Cranial Nerves and Lateral Sense-organs of the Elasmobranchs* (1889-91); *The Development of the Limbs of the Horse* (1894); *The Penicuik Experiments* (1899).

EWING, JULIANA HORATIA, author of many attractive children's books, was born in 1841 at Eoclesfield, Yorkshire, where her father was vicar. From early youth she showed a great faculty for story-telling and play-acting, and later she con-

tributed largely to a magazine started by Mrs. Gatty, her mother. On her mother's death the magazine was edited by her and her sister conjointly, and many of her best stories first appeared in it. She married Major Alexander Ewing of the Army Pay Department in 1867. Her death took place at Bath on May 13, 1885. Of her delightful tales of child-life we may mention: *Mrs. Overthway's Remembrances*; *The Land of Lost Toys*; *The Peace Egg*; *Lob-lie-by-the-fire*; *Jackanapes*; *Jan of the Windmill*; *The Story of a Short Life*; *We and the World*; *A Flat Iron for a Farthing*; *Six to Sixteen*; *Old-Fashioned Fairy Tales*; and *A Great Emergency*. A biography by Mrs. Horatia Gatty was published in 1885 under the title *Juliana Horatia Ewing and her Books*.

EXPLOSIVES are compounds practically available in war, in mining, and in general use for the sudden development of immense force. They comprise gunpowder, gun-cotton, nitro-glycerine with its compounds dynamite, litho-fracteur, &c. (See GUN-COTTON, GUNPOWDER, DYNAMITE, &c.) An Explosives Act for Britain, to amend the law with respect to the manufacturing, keeping, selling, carrying, and importing explosive substances, was passed in 1875; and a very severe amendment act to check the use of explosives for felonious purposes became law in 1883, being passed through both Houses of Parliament in a very short time. See GUNPOWDER, LAWS RELATING TO.

EXTINCTEUR. See FIRE ANNIHILATOR.

EXUMA, GREAT and LITTLE, two of the Bahama Islands. The former is 30 miles long and 3 miles wide, and has a good harbour. Pop. 2300. See BAHAMA ISLANDS.

EYEMOUTH, a fishing town of Berwickshire, Scotland, at the mouth of the Eye, 8 miles north-west of Berwick-upon-Tweed, an important place in the thirteenth century. It has narrow irregular streets, but has been improved in various ways in recent times. Pop. (1891), 2576.

EYRE, EDWARD JOHN, Australian explorer and colonial governor, was born in Yorkshire on Aug. 5, 1815. He was educated at Sedburgh grammar-school (Yorkshire), and went to Australia in 1833. In 1839 he discovered Lake Torrens, and in 1840 explored its eastern shores and the adjacent Flinders Range. He then commenced his perilous journey along the shores of the Great Australian Bight, and reached King George's Sound, in Western Australia, a distance of 1200 miles, with a single native boy, having left Adelaide more than a year before. In 1845 he published *Discoveries in Central Australia*. After filling several governorships he was appointed Governor of Jamaica in 1862. In 1865 he was confronted with a negro rebellion which he crushed with some severity, and was recalled. On his return to England John Stuart Mill and others took measures to have him tried for murder, but failed. In regard to this question Carlyle was one of his most strenuous defenders. He afterwards lived in retirement, and died at Tavistock on Nov. 30, 1901.

F.

FABER, FREDERICK WILLIAM, D.D., a theologian and hymn-writer, the nephew of George Stanley Faber, was born at Calverley Vicarage, Yorkshire, on June 28, 1814. His earliest education was received at Bishop Auckland grammar-school and at

Kirkby Stephen, Westmoreland, and he subsequently attended Shrewsbury and Harrow Schools. In 1838 he entered Balliol College, Oxford, where he graduated B.A. in 1836, carrying off the Newdigate prize, in the same year for a poem on the Knights of St.

John. At Oxford he came under the influence of John Henry Newman, whom in 1845 he followed into the Roman Catholic Church. Ordained deacon in 1837, and priest in 1839, he became rector of Elton, Huntingdon, in 1842, a post which he held till his secession from the Church. On becoming a Roman Catholic he founded a small community called Brothers of the Will of God, who three years later joined the oratory of St. Philip Neri. He afterwards established a branch of this oratory at Brompton, with which he was connected till his death on Sept. 28, 1863. His prose writings are numerous, but it is by his beautiful hymns that he is best known. Of these, *Pilgrims of the Night* and *The Land beyond the Sea* are the most noted.

FAED, JOHN, R.S.A., Scottish artist, was born at Burley Mill, Kirkcudbrightshire, in 1820. He early showed ability as a draughtsman and painter, and in 1841 he went to Edinburgh to study. He soon won a considerable reputation, and was elected Associate of the Royal Scottish Academy in 1847, becoming full academician four years afterwards. In 1851 he exhibited a work entitled *The Cruel Sisters*, and this was followed by *The Cotter's Saturday Night* (1854); *The Philosopher* (1855); *The Household Gods in Danger* (1856); *Job and his Friends* (1858); and *Boaz and Ruth* (1860). Going to London in 1862, he began to exhibit in the Royal Academy as well as in the Scottish Academy, some of his pictures shown since that date being: *Catherine Seyton* (1864); *Old Age* (1867); *John Anderson, my Jo* (1869); *After the Victory* (1873); *The Morning before Flodden* (1874); *Blenheim* (1875); *In Memoriam* (1876); *The Old Basket-Maker* (1878); and *The Poet's Dream* (1882).

FAED, THOMAS, R.A., younger brother of the preceding, was born at the same place on June 8, 1826. He studied at the School of Design in Edinburgh, where at an early age he became known as a clever painter of rustic subjects. In 1849 he was elected an Associate of the Royal Scottish Academy, and in 1852 he settled in London, where he won a high reputation, becoming A.R.A. in 1859, and full academician five years afterwards. He retired in 1893, and died on August 22, 1900. The subjects of his brush are for the most part domestic or pathetic, and in these he has attained a success that emulates that of Wilkie. Among his principal works are: *Sir Walter Scott and his Friends* (1849); *The Mitherless Bairn* (1855); *The First Break in the Family* (1857); *Sunday in the Backwoods* (1859); *His Only Pair* (1860); *From Dawn to Sunset* (1861); *The Last o' the Clan* (1865); *Pot Luck* (1866); *Worn Out* (1868); *Homeless* (1869); *The Highland Mother* (1870); *Winter* (1872); *Violets and Primroses* (1874); *She Never Told her Love* (1876); and *Maggie and her Friends* (1878). A number of Mr. Faed's works have been engraved in large size by his brother James, and have been very popular.

FAIDHERBE, LOUIS LÉON CÉSAR, a French general, was born at Lille on June 8, 1818. He studied with great success at Lille and afterwards at the École Polytechnique, and, entering the army in 1840, became lieutenant in 1842. During the next five years he was located in Algiers, and in 1848 he was sent to Guadeloupe, whence he returned to Algiers in the following year. From 1854 till 1861, and again from 1863 till 1865, he was governor of Senegal, in which capacity he considerably extended the French possessions there by subduing many native tribes. After the fall of Napoleon III. he was summoned by the government of National Defence to France and appointed commander of the army of the north. He fought some bloody but in-

decisive battles with the Germans under Manteuffel and Goeben. After the war he was elected to the Assembly by the department Nord, but on the triumph of Thiers retired from politics to private life. In the latter part of his life he went on a mission to Egypt to study the monuments and hieroglyphics. He wrote valuable monographs on Senegal, the Soudan, and other parts of Africa, including *L'Avenir du Sahara et du Soudan* (1863); *Collection Complète des Inscriptions Numidiques* (1870); *Nouvelles Inscriptions Numidiques* (1872); *Langues Sénégalaises* (1887); and *Le Sénégal: la France dans l'Afrique Occidentale* (1889). On the Franco-German war he published *Campagne de l'Armée du Nord en 1870-71* (1872). He died at Paris on Sept. 29, 1889.

FAINTING. See **SYNCOPE.**

FAIRBAIRN, ANDREW MARTIN, theologian, was born near Edinburgh on Nov. 4, 1838. He studied at the University of Edinburgh, and subsequently at that of Berlin, and having qualified for the ministry of the Evangelical Union, he was appointed to a church of that denomination at Bathgate in 1860. Accepting a similar charge in Aberdeen in 1872, he ministered there for five years, till his appointment in 1877 to the principality of Airedale Independent College, Bradford. On the foundation of Mansfield College, the Congregational theological college at Oxford, in 1886, he was appointed principal, a post which he still occupies. He is M.A. of Oxford, D.D. of Edinburgh (1878) and of Yale (1889), and LL.D. of Aberdeen (1895). From 1878 till 1882 he was Muir Lecturer on the Philosophy and History of Religion in Edinburgh University. He delivered the Aberdeen Gifford Lectures of 1892-94, and the Lyman Beecher Lectures at Yale in the previous year, and in 1894 he was selected to sit on the Royal Commission on Secondary Education. Several able works have come from his pen, of which the most important are: *Studies in the Philosophy of Religion and History* (1876); *Studies in the Life of Christ* (1881); *The City of God* (1882); *Religion in History and in Modern Life* (1884, revised and enlarged edition 1893); *Christ in the Centuries* (1892); *The Place of Christ in Modern Theology* (1893); and *Catholicism, Roman and Anglican* (1899). Dr. Fairbairn has also contributed many excellent articles to various periodicals.

FAIRBAIRN, SIR WILLIAM, Baronet, civil engineer, was born at Kelso, Roxburghshire on Feb. 19, 1789, received an elementary education at the parish school of Mullochy in Ross-shire, and was apprenticed a millwright at a colliery in North Shields. After the close of his apprenticeship he wrought at his trade for two years in London, and afterwards made a working tour in England, Wales, and Ireland to observe the different methods of the various localities. He commenced business on his own account in Manchester with a Mr. Lillie in 1817. He introduced the use of iron instead of wood in the shafting of cotton-mills, as well as other economies in the weight of material, by which a saving of expense and a vast increase of speed were gained; improvements in engines, contrivances for the consumption of smoke, &c., also occupied his attention. He was among the first to advocate the use of iron as a material for ship-building; and his firm was extensively employed in iron ship-building at Millwall, in London. He made valuable experiments on the strength of various kinds of iron, on the tenacity of boiler plates, the advantages of different modes of riveting, and the resistance of hollow tubes to outward pressure. His experiments on the resistance of tubes materially conduced to the construction of the tubular bridge over the Menai Straits,

the merit of which was disputed between Fairbairn and Stephenson, with the latter of whom the idea originated. The use of wrought-iron plate girders in this and many other structures of the same kind was apparently due to the experiments of Fairbairn. Fairbairn was one of the earliest members of the British Association for the Advancement of Science, and was president of the association in 1861-62. He was a fellow of the Royal Society, a corresponding member of the Institute of France and of the Royal Academy of Turin, and an LL.D. of the University of Edinburgh. He was created a baronet in 1869, having previously refused the honour of knighthood. He died 18th August, 1874. Among the professional works of Fairbairn are: On Canal Steam Navigation (1831); Iron—its History, Properties, and Manufacture (1841); Construction of the Conway and Britannia Bridges (1849); Application of Iron to Building Purposes (1854); Construction of Boilers, and Boiler Explosions (1851); Metals (1857); Useful Information for Engineers (two series, 1860); Treatise on Mills and Mill-work (1861); Iron Ship-building (1865); of some of which there have been several editions. See the *Life* (1877), partly autobiographical.

FAIR ISLE, a solitary Shetland island lying midway between Shetland and Orkney, and 30 miles by sea s.w. of Lerwick. It is 3 miles long and 2 miles broad; is inaccessible, except at North Haven, on the north-east coast, on account of the steep cliffs; and rises, in the Ward Hill, to the height of 711 feet. Sheep Craig is a promontory on the south-east coast 480 feet high. There is some good sheep pasture, but the men employ themselves chiefly in fishing, and the women in knitting the well-known Shetland hosiery. They are said to have acquired this art from the Spanish seamen whose ship, belonging to the Armada, was wrecked here in 1588. Pop. (1891), 223.

FAIR TRADE, an economic policy advocated by many in Britain, who, while not opposed to free-trade in principle, would meet the prohibitory tariffs that foreign countries may put on British goods by placing equally heavy duties on goods sent from these countries to Britain. This principle, which is in reality a sort of compromise between free-trade and protection, also goes by the name of reciprocity. See **FREE-TRADE**.

FAIZABAD. See **FYZABAD**.

FAMINE, a dire want of food affecting considerable numbers of people at the same time. Irregular rainfalls in tropical climates, imperfect methods of irrigation, or, as in Ireland, the too exclusive dependence of the mass of the people on a single article of food which happens to fail, are amongst the commonest causes of famines. In the early and mediæval ages they were frequent; but the rapidity of modern communication and transport has made the rigour of famine almost impossible in Europe. In Ireland, famines more or less serious have at various times prevailed owing to failure of the potato crop. In 1846 the dearth was so great that ten millions sterling were voted by parliament for relief of the sufferers. India has long been the seat of terrific famines, but of late the British officials have been very successful in organizing relief measures. Amongst the more recent are that in North-west India (1837-38), in which above 800,000 perished; that in Bengal and Orissa (1865-66), when about a million perished; that in Bengal (1874), which was very successfully treated; that in Bombay, Madras, and Mysore (1877), in which about half a million died; and those of 1896-97 and 1899-1900, over a large area in India, which the authorities grappled with very successfully, large subscrip-

tions being received from the home countries and the British colonies. In China a great famine took place in 1877-78, in which over nine millions are said to have perished; another took place in 1888-89, owing to the overflow of the Yellow River. Although many of the causes of famine are beyond human control, it is very probable that the extension of sound agricultural knowledge and the adoption of a more rational system as regards the kinds and quantities of crops grown will in the future render famine almost unknown in most countries.

FANNING ISLANDS, a group of coral islands situated in the Pacific between 1° 57' and 5° 49' n. lat., and between 157° and 162° w. lon. It comprises Jarvis, Christmas, Washington, Palmyra, and Fanning Island. The latter (which is also called American Island) was annexed by Great Britain in 1888, and has about 150 inhabitants. It is an atoll measuring 9 miles by 4, and is covered with coconut trees. Christmas Island has also been annexed by Britain, the idea being that the islands may be of use in connection with the proposed telegraph from Vancouver to Australasia, or as the site of a coaling-station.

FANS, also known as **PAHUNA**, **OSHEKA**, **MPANGWA**, &c., an African people who emigrated from the interior to the coast of French Congo during the first half of the nineteenth century. They now number about 300,000 in the neighbourhood of the mouths of the Ogowe and the Gaboon. Burton, Lums, Reade, and other travellers describe them as a warlike and highly intelligent people, differing markedly from the surrounding negroid or Bantu tribes. Their complexion is rather light, their beard long, their frontal bone very prominent, and they are tall and well-built. They were formerly much given to eating human flesh, but their cannibalistic tendencies have been checked by contact with the Europeans of the coast regions.

FARADIZATION, the medical application of the magneto-electric currents which Faraday discovered in 1837. See **ELECTRICITY**, **MEDICINAL APPLICATIONS OF**, in **SUPP.**, and **INDUCED CURRENT**.

FARIBAULT, a town of Minnesota, United States, capital of Rice county, 53 miles south of St. Paul. Here are the state asylum for the deaf, dumb, and blind, and an Episcopal divinity college. Pop. (1890), 6520.

FARIDPUR, a town of India, in the Dacca Division of Bengal, on the *Mara Padma*. Pop. (1891), 10,774.

FARJEON, BENJAMIN LEOPOLD, English novelist of Jewish descent, was born in London in 1833, and educated privately. He spent some years in Australia and New Zealand as journalist and novelist, and was the editor and co-proprietor of the first daily newspaper published in the latter country. His first successful novel was *Grif: a Story of Australian Life*, published in 1870. It was followed next year by *Blade-o'-Grass*, and in 1872 by *Joshua Marvel*. Of his subsequent works the following may be cited:—*London's Heart* (1873); *Love's Victory* (1875); *At the Sign of the Silver Flag* (1876); *Solomon Isaacs: a Christmas Story* (1877); *Great Porter Square: a Mystery* (1884); *The House of White Shadows* (1884); *Self-doomed* (1885); *Set in a Silver Sea* (1886); *The Nine of Hearts* (1886); *The Tragedy at Featherstone* (1886); *The Secret Inheritance* (1887); *Toilers of Babelion* (1888); *Miriam Rozella* (1897); and *Samuel Boyd of Catchpole Square* (1899). Mr. Farjeon has been compared with Dickens in his 'sentiment and minute characterization', and a lively realism pervades his work.

FARRAR, FREDERICK WILLIAM, English divine and writer on various subjects, was born at Bombay on Aug. 7, 1831. He studied at King William's

College, Isle of Man, and at King's College, London, and graduated B.A. of London University in 1852. The same year he went to Trinity College, Cambridge, having gained one of the college scholarships. His career there was a distinguished one, and in 1854 he graduated B.A. with honours in classics and mathematics, being fourth classic and third among the junior optimes, while in 1856 he was elected a fellow of his college. He was ordained deacon in 1854 and priest in 1857, and for a number of years he was an assistant master at Harrow. From 1871 till 1876 he was head-master of Marlborough College, resigning on his appointment as a canon of Westminster and rector of St. Margaret's. In 1883 he was appointed Archdeacon of Westminster, and in 1895 he became Dean of Canterbury. Dr. Farrar has repeatedly been select preacher at Cambridge; in 1890 he was Lady Margaret's preacher, and in 1870 he delivered the Hulsean lectures. From 1890 till 1895 he acted as Chaplain to the House of Commons. Besides identifying himself with various social and philanthropic movements, he has published many popular and able works of various kinds. In fiction he has written: *Eric*, or *Little by Little* (1858); *Julian Home: a Tale of College Life* (1859); *Gathering Clouds*; a *Tale of the Days of St. Chrysostom* (1896); and others. In philology, *Origin of Language* (1860); *Families of Speech* (1870); *Language and Languages* (1878); &c.; and on theological and religious subjects we have from him: *Seekers after God* (1869); *The Witness of History to Christ* (1871, his Hulsean lectures); *Life of Christ* (1874), a work which has achieved extraordinary popularity; *Life of St. Paul* (1879), also highly popular; *Early Days of Christianity* (2 vols., 1882); *History of Interpretation* (1885), Bampton lectures; *Lives of the Fathers* (2 vols., 1889), a popular work; *The Bible: its Meaning and Supremacy* (1897); *The Herods* (1897); and *The Life of Lives* (1899). Many of his sermons have also been published. He has also been an extensive contributor to commentaries and encyclopædic works; is a D.D. of Cambridge, a Fellow of the Royal Society, &c.

FASHODA, a town of the Egyptian Soudan, situated on the Bahr-el-Abiad or White Nile, 400 miles south of Khartoum and about 70 north-east of the confluence of the Sobat river with the Nile. In July, 1898, it was occupied by a small French force, but some months later it was claimed by the British for Egypt. Ultimately the French force evacuated the town, which was then formally occupied by Soudanese troops.

FATEGARH, a town in the North-west Provinces of India, 8 miles from Farukhabad (with which it forms one municipality), the head-quarters of the Farukhabad district, a military station and cantonment, and also a mission station with church and schools. It was the scene of a massacre of upwards of 200 Europeans during the mutiny of 1857. Gun-carriages and tents are made here. Pop. (1891), 12,435.

FATEHPUR, an Indian town in the district of the same name, Allahabad division, North-west Provinces, 50 miles s.e. of Cawnpore. Its trade is mainly in hides, soap, and grain. Pop. (1891), 20,179.

FATHERLASHER, a fish of the genus *Cottus* or bull-head (*Cottus bubalis*), from 8 to 10 inches in length. The head is large, and is furnished with several formidable spines. The fish is found on the rocky coasts of Britain, and near Newfoundland and Greenland. In the latter regions it attains a much larger size, and is a considerable article of food.

FATTY DEGENERATION, an abnormal condition found in the tissues of the animal body, in which the healthy protoplasm is replaced by fatty

granules. It is a sign of defective nutrition, and is common in old age, affecting the muscles, the heart, arteries, kidneys, &c., but it may also result from intemperate habits. It is accompanied by great muscular flabbiness and want of energy, the sufferer looking at the same time fat and comparatively well.

FATWA, a town, Patna district, Bengal, 8 miles from Patna city, at the junction of the Fumpan with the Ganges, a place of great sanctity to Hindus. It stands on the East Indian Railway, and has a considerable trade. Pop. (1891), 10,919.

FAVRE, GABRIEL CLAUDE JULES, French politician, was born 21st March, 1809, at Lyons. He studied law, and after distinguishing himself at the Lyons bar came to Paris in 1835, where he became famous as a defender of political prisoners. On the outbreak of the revolution of 1848 Ledru-Rollin made him secretary to the ministry of the interior. He was a leader of the party of opposition to the President Louis Napoleon; and after the coup d'état (1851) he retired from political life for six years, till in 1858 his defence of Orsini for the attempt on the life of the emperor again brought him forward. From this time he again became an active leader of the Republican opposition to the emperor. On the fall of the empire he became Vice-president of the Government of National Defence and Minister of Foreign Affairs. As such he conducted the negotiations for peace with Prince Bismarck. But though he showed great energy and was very eloquent, his operations both in the matter of the armistice and the peace showed a lack of skill and judgment. He died at Versailles on Jan. 20, 1880. He was author of: *Rome et la République Française* (1871); *Gouvernement de la Défense Nationale* (3 vols., 1871-75); *Conférences et Discours Littéraires* (1873). After his death his widow published his *Discours Parlementaires* (4 vols., 1881), and Maritain edited his *Mélanges Politiques* in 1882.

FAVUS, crusted or honey-combed ringworm, a disease chiefly attacking the scalp, and characterized by yellowish dry incrustations, usually rounded and cyathiform. It is produced by a fungous growth. It is infectious, and spreads rapidly if not attended to, and when on the scalp it causes the hair to fall out. The incrustation should be regularly removed and the head treated with ointments calculated to kill the organisms producing the disease.

FAWCETT, MILICENT GARRETT, writer and lecturer, wife of Henry Fawcett, the politician and political economist, was born at Aldeburgh, Suffolk, on June 11, 1847. She was married at the age of twenty, but lost her husband in 1884 (see **FAWCETT, HENRY**). She has taken a very prominent part in many movements relating to women, more particularly in that for obtaining the parliamentary franchise for them. In 1889 she was elected president of the Women's Unionist Association. Her published works include: *Political Economy for Beginners* (1870); *Tales in Political Economy* (1875); *Janet Doncaster*, a novel (1875); *Some Eminent Women of our Time* (1889); and *Life of Queen Victoria* (1895). With her husband she published in 1872 a volume of *Essays and Lectures*, and the article on Communism in the ninth edition of the *Encyclopædia Britannica* is from her pen.

FEASTS. See **FESTIVALS**.

FEBRIFUGE, a medicine employed to drive off or diminish fever. The word is practically synonymous with antipyretic. Among the chief febrifuges are quinine, salicine, salicylic acid, antipyrin, thallin, and kairin. See **FEVER**.

FELANICHE. See **FELANITZ**.

FELEGYHAZA, a town of Hungary, 66 miles s.e. of Budapest, with large cattle-markets and an

extensive trade in corn, wine, and fruit. It was rebuilt about the middle of the eighteenth century, after having been destroyed. Pop. (1800), 33,408.

FELLING, a populous locality in Durham, on the south bank of the Tyne, a little to the south-east of Newcastle and adjoining Gateshead, consisting of the combined villages of High and Low Felling, &c., and forming an urban sanitary district with a population of 22,467 in 1901. There are here many industrial works, such as chemical works, forges, factories, coal-mines, &c. The village contains several churches and a church institute.

FENN, **GEORGE MANVILLE**, novelist, was born at Westminster on Jan. 3, 1831, and received his education at private schools. After studying at a training college he became a country schoolmaster, and afterwards acted as a private tutor. He next turned to the business of printing and newspaper proprietorship, from which he soon drifted into literature. His earliest literary ventures were short sketches published in *All the Year Round*, *Chambers's Journal*, and *Once a Week* (of which he became proprietor in 1873), and he also contributed papers to the *Star* newspaper. In 1867 he published *Holldell Grange*, a story for boys, which has since been followed by a long series of excellent and highly popular tales and novels, many of them boys' stories. The following may be specially mentioned: *Bent, not Broken* (1867); *The Parson o' Dumford* (1879); *Eli's Children* (1882); *The New Mistress* (1883); *Double Cunning* (1886); *The Master of the Ceremonies* (1886); *The Man with a Shadow* (1888); *A Double Knot* (1890); *The Mynns Mystery* (1891); *King of the Castle* (1892); *In an Alpine Valley* (1893); *Blue-jackets* (1893); *High Play* (1898). A number of his tales have been specially written for Christmas. Among his boys' books may be mentioned: *In the King's Name*, *Nat the Naturalist*, *Bunyip Land*, *Menhardoc*, *Patience Wins*, *Brownsmith's Boy*, *Commodore Junk*, *The Crystal Hunters*, *The Grand Chaco*, *Blue-jackets*, *Fire Island*, &c. Mr. Fenn has also produced, either alone or in collaboration, several works for the stage.

FENNEC (*Canis zerda*), a small animal allied to the dog and fox, and sometimes called the Sahara fox, being a native of that region. It lives on birds, jerboas, lizards, dates, &c., burrows with great facility, and is easily tamed. It is fox-like in appearance, and is remarkable for the great size of its ears.

FENTON, a town of North Staffordshire, England, situated immediately to the south-east of Stoke-upon-Trent. The chief industries are china and earthenware manufacture, brick-making, coal-mining, and iron-founding. It forms part of the parliamentary borough of Stoke. Pop. (1901), 22,742.

FENUGREEK, a leguminous plant, *Trigonella Fenum-græcum*, lucerne-like in habit, whose bitter and mucilaginous seeds are used in veterinary practice. It is an erect annual, about 2 feet high, a native of the south of Europe and of some parts of Asia, and is much cultivated in India and other warm countries. It contains the principle coumarin.

FER-DE-LANCE, the lance-headed viper or *Craspedophthalmus (Bothrops) lanceolatus*, a serpent common in Brazil and some of the West Indian Islands, and one of the most terrible members of the rattlesnake family (Crotalidae). It is 5 to 7 feet in length. The tail ends in a horny spine which scrapes harshly against rough objects, but does not rattle. Its bite is almost certainly fatal. See **RATTLESNAKE**.

FERGHANA, a province of Asiatic Russia, in Turkestan, formed in 1876 out of the conquered land of Khokand, lying to the south of Samar-

kand, Syr-Darya, and Semirychensk, and to the north-east of Bokhara. It consists mainly of a valley surrounded by high ranges of mountains and traversed by the Syr-Darya and its tributaries; area, 35,654 square miles. The climate is warm, and the soil in part fertile, but a considerable portion of the country is desert. Pop. (1897), 1,525,186. Khokand formerly was the capital, but Marghilan now occupies that position. See **TURKESTAN**.

FERGUSON, **JAMES**, a writer on architecture and archaeological subjects, was born at Ayr in 1808, his father being Dr. W. Ferguson, inspector-general of military hospitals. He went out to India as partner of an important commercial house, started an indigo factory on his own account, and after some years retired from business to devote himself to the study of architecture and early civilizations. In 1846 he published *Illustrations of the Rock-cut Temples of India*; in 1849, *A Historical Enquiry into the True Principles of Beauty in Art*; and in 1851, *The Palaces of Nineveh and Persepolis Restored*. In 1855 he gave to the public an *Illustrated Handbook of Architecture*; in 1862, *History of the Modern Styles of Architecture*, a sequel to the handbook, both being afterwards combined in his *History of Architecture in All Countries, from the Earliest Times to the Present Day* (3 vols., 1865-67), and completed by a *History of Indian and Eastern Architecture* (1876), the whole forming a trustworthy and admirably illustrated work. He also wrote on the site of the Holy Sepulchre at Jerusalem; *Tree and Serpent Worship*; *Rude Stone Monuments in All Countries*, &c. He died on Jan. 9, 1886.

FEROZPOOR. See **FIROZPUR** in SUPP.

FERRIER, **DAVID**, a distinguished authority on the physiology of the brain, was born at Woodside, near Aberdeen, in 1843. He went through the arts curriculum at Aberdeen University with great distinction, graduating as M.A. in 1863 with first-class honours both in classical literature and mental science; and the same year he carried off the inter-university Ferguson Scholarship in classics and philosophy. He then studied for a short time in the University of Heidelberg, and on his return to Scotland took the medical course at Edinburgh, and graduated M.D. with very high distinction in 1870. In 1872 he became Professor of Forensic Medicine in King's College, London, a chair which he exchanged in 1889 for that of Neuro-pathology, specially founded for him. This professorship he still holds, and he is, in addition, physician to King's College Hospital and to the National Hospital for the Paralysed and Epileptic. Professor Ferrier has gained a great reputation by his investigations of the structure of the brain, particularly in connection with the localization of its functions. His results are stated in his works on the *Functions of the Brain* (1876), and *Cerebral Localization* (1878). He was elected a Fellow of the Royal Society in 1876, and many other learned bodies have conferred honours on him. His researches necessitated a large number of experiments on living animals, and he has, in consequence, been strongly attacked by the anti-vivisectionists.

FEUILLET, **OCTAVE**, a French novelist and dramatist, was born at Saint Lô, department of Manche, Aug. 11, 1812. He distinguished himself as a student of the Lycée Louis-le-Grand, and afterwards studied law. Between 1845 and 1858 he gained a good deal of notice with his novels and a series of comedies and tales, some of which were

realists of the day, and was immediately dramatised by the author himself. Next followed *Histoire de Sabylla* (1862), and in the year in which it appeared Feuillel was elected to the French Academy, succeeding to the fauteuil of Scribe. Amongst his other numerous novels are *Monsieur de Camors* (1867); *Julia de Trécor* (1872); *Un Mariage dans le Monde* (1875); *Le Journal d'une Femme* (1878); *Histoire d'une Parisienne* (1882); *La Mort* (1886); *Le Divorce de Juliette* (1884); *Honneur d'Artiste* (1890); &c. His works have a refined humour, and are free, especially the earlier, from the common French coarseness. His dramas also met with considerable success, but they are on the whole inferior to his novels. He died at Paris on Dec. 29, 1890. Feuillel's *Théâtre Complet* appeared in 5 volumes in 1892-93. He was succeeded in the Academy by Pierre Loti.

FEZ, named from the town Fez, a red cap of fine cloth, with a tassel of blue silk or wool at the crown, much worn in Turkey, on the shores of the Levant, in Egypt, and North Africa generally. The core or central part of a turban usually consists of a fez. They are now manufactured in Tunis and in some European countries.

FIGUS, the fig genus of plants. See FIG.

FIDDLE-FISH. See MONK-FISH.

FIEF. See FEZ, FEUDALISM.

FIELD, CYRUS WEST, an American merchant, was born at Stockbridge, in Massachusetts, on Nov. 30, 1819, and was the son of a clergyman. He early attained an important position in the mercantile world, and began to interest himself in ocean telegraphy. Having obtained a charter giving him the exclusive right for fifty years of landing ocean telegraphs on the coast of Newfoundland, he organized an Atlantic telegraph company for the purpose of laying telegraph cables across the ocean. Attempts to lay cables were made in 1857 and 1858, but without permanent success, though ships had been provided by the British and the American governments. The scheme was interrupted by the outbreak of the American Civil War, but a renewed attempt to lay a cable was made in 1865, the *Great Eastern* now being engaged in the work. About 1200 miles had been laid by that vessel when the cable parted; but at last, in 1866, a cable was successfully laid by the *Great Eastern*, and the broken one recovered and completed. Mr. Field subsequently took an active part in establishing telegraphic communication with the West Indies, South America, &c., and was connected with various important enterprises. He died near New York in July, 1892.

FIGHTING-FISH (*Macropodus* or *Ctenops* or *Betta pugnax*), a small fish of the family Anabesidae (climbing perch), a native of the south-east of Asia, remarkable for its pugnacious propensities. In Siam these fishes are kept in glass globes, as we keep gold-fish, for the purpose of fighting, and an extravagant amount of gambling takes place about the result of the fights. When the fish is quiet its colours are dull, but when irritated it glows with metallic splendour. The King of Siam derives a considerable revenue from the licenses for fish-fights.

FIGUIER, LOUIS, a French writer of popular works on science, was born at Montpellier on Feb. 15, 1819. He was for a time professor in the School of Pharmacy of his native town, and in 1853 he was appointed to a post in a similar school at Paris. Among his works are: *Exposition et Histoire des Principales Découvertes Scientifiques Modernes* (6th ed., 1882); *Histoire du Merveilleux dans les Temps Modernes* (4 vols., 1859-62); *L'Alchimie et les Alchimistes*; *Vies des Savants Illustres depuis l'Antiquité jusqu'à XIX Siècle* (2nd ed., 1875);

Les Grandes Inventions; *Le Tableau de la Nature* (10 vols., 1862-78); *Le Lendemain de la Mort* (10th ed., 1894); &c. Several of his works have been translated into English, including different sections of the *Tableau*, such as *The Mammalia*, *Birds* and *Reptiles*, &c. He died on Nov. 12, 1894.

FILDES, LUKE, portrait and genre painter, was born in Lancashire in 1844. His art-training was received in the South Kensington Art Schools and in the Royal Academy, and his earliest productions were drawings for the *Graphic*, *Once a Week*, *Cornhill Magazine*, and other periodicals. He was chosen to illustrate the last works of Charles Dickens and Samuel Lover, and he subsequently took to painting. His first Academy picture was *Nightfall* (1868), and since then he has exhibited: *The Loosened Team* (1869); *The Empty Chair* (1871); *Fair, Quiet, and Sweet Rest* (1872); *Simpletons* (1873); *Applicants for Admission to a Casual Ward* (1874); *Betty* (1875); *The Widower* (1876); *Playmates* (1877); *The Return of the Penitent* (1879); *The Village Wedding*; *Venetian Life*; *The Al-fresco Toilette*; and *The Doctor* (1892). Several of these, and particularly his famed *Casual Ward*, show powers of realism in painting not unlike those of Dickens in fiction, but his later works are more striking from their colour-effects. Latterly he has taken a distinguished place as a painter of portraits. Elected A.R.A. in 1879, he became full academician in 1887. His wife is also known as a painter, some of her pictures being: *The Cottage Door* (1877); *Peeling Potatoes* (1878); and *A Berkshire Cottage* (1878).

FILE-FISH, a name given to certain fishes from their skins being granulated like a file; they constitute the genus *Balistes*. *B. capricornis*, a common inhabitant of the Mediterranean, has the power of inflating the sides of the abdomen at pleasure, and grows to the size of 2 feet. *B. aculeatus* is a native of the Indian and American seas.

FILICES. See FERNS.

FIN-BACK, or **FINNER**, a name given to the species of a genus of whales (*Physeter*), so called from their possessing a dorsal hump or fin. The name is also sometimes given to the members of the genus *Balaenoptera* or rorquals. See WHALE.

FINDHORN, a Scottish salmon river which, rising among the Monadhliath Mountains, flows in a generally north-east direction through the counties of Inverness, Nairn, and Elgin, and falls into the Moray Firth after a course of 62 miles. Some distance above its mouth the river expands to a considerable breadth, but before entering the sea it again contracts to normal dimensions. It is subject to frequent and severe spates. The scenery of its course is very beautiful.

FINDLAY, a city of the United States, capital of Hancock county, Ohio, situated midway between Fremont and Lima, 90 miles north-west of Columbus. It has machine-shops, flour-mills, woollen factory, saw-mills, potteries, brick-works, &c. Pop. (1870), 3315; (1890), 18,558.

FINLAY, GEORGE, historian, was born 21st December, 1799, at Faversham, in Kent, where his father, Captain John Finlay, R.E., a member of a well-known Glasgow family, was superintendent of the government powder-mills. He was educated partly in England, partly at Glasgow, where, as well as at Göttingen, he studied law. Fired with enthusiasm on behalf of Greece he went to that country to help it in shaking off the Turkish yoke, and spent some time at Missolonghi in close intimacy with Lord Byron. An attack of fever brought him back to Scotland; but he soon returned to Greece, and was actively engaged in fighting or otherwise till Greek liberty was secured. He purchased land in Attica,

little to his own personal profit, and henceforth lived chiefly in Greece, constantly working in one way or another for the land of his adoption. With the country and people he naturally became thoroughly acquainted, and he himself was held in high respect in Greece, though he was by no means backward in drawing attention to the defects of the Greek national character and to the errors of Greek statesmen. He died at Athens 26th January, 1875. His great work on Greek history came out at intervals between 1844 and 1861, the different sections being respectively entitled: Greece under the Romans (1844), Greece from its Conquest by the Crusaders to its Conquest by the Turks (1851), Greece under Ottoman and Venetian Domination (1856), and the Greek Revolution (1861). Shortly after his death it was published as thoroughly revised and greatly improved by himself, under the editorship of the Rev. H. F. Tozer, and with the title of *A History of Greece from its Conquest by the Romans to the Present Time, B.C. 146 to A.D. 1864*. It is a work of great erudition and insight, written by a man of powerful intellect, and has been described as the greatest historical work in English since Gibbon's *Decline and Fall*.

FINNER. See **FIN-BACK** in SUPP.

FIORIN (*Agrostis alba*), a common British grass found in pastures and waste places. It is not of much agricultural value. A stoloniferous variety, sometimes called *A. stolonifera*, is often a troublesome weed.

FIRBOLGS, one of the legendary or fabulous tribes of the earliest period of Irish history. They are said to have come from Thrace under the command of five brothers, and to have settled in three divisions. Some of the Irish historians begin their account of the Irish monarchy and list of kings with Slinge, the first Firbolg king, who began to reign 1934 B.C. They are said to have been driven out, or subjugated, by a kindred tribe, the Tuatha de Danann, from Scotland, who in turn were expelled or conquered by the Milesians. The Firbolgs may, it has been thought, correspond to the pre-Aryan inhabitants of Ireland.

FIRE-ALARM, an apparatus, mechanical, electric, and telegraphic, used for detecting fires, and for giving instantaneous notice of an outbreak. Detectors are often placed in the different apartments of a building, which ring an alarm when the temperature reaches a certain height. Some of the earlier forms acted by the releasing of a weight through the burning away of a hempen cord saturated with inflammable material; others depend on the expansion of air in tubes; and in still others the expansion of a body of mercury causes a strain in a piece of iron wire, which thus breaks, and in so doing releases the escapement of a clockwork system, which in turn rings a bell. In some alarms the automatic machinery is so contrived as not only to give notice of fire, but also to turn on a current of water or liberate carbonic acid gas at the scene of the fire. In large towns a series of signal-boxes is distributed in different quarters from which an alarm can be immediately telegraphed to the fire-brigade station.

FIROZABAD, town and municipality in Agra district, North-western Provinces of India, 24 miles east of Agra. It contains numerous ruins of handsome buildings, and is a station on the East Indian Railway, 817 miles from Calcutta. Pop. (1891), 15,278.

FIROZPUR, a thriving commercial town, Punjab, India, 3½ miles from the Sutlej, capital of a district of the same name. It has wide and well-paved main streets, town-hall, and various other

public buildings, and an arsenal, the largest in the Punjab. It was gradually losing its old importance when it came into the possession of Britain; but since then it has advanced considerably. It has a trade in grain and manufactures of cotton. Pop., including the military cantonments 2 miles south of the city (1891), 50,487.—**FIROZPUR** is also the name of a town in Gurgaon district, Punjab. Pop. (1891), 6848.

FIROZSHAH, a battle-field in Firozpur district, Punjab; the scene of the defeat of the strongly-intrenched Sikh army by the British forces under Sir Hugh Gough and Sir Henry Hardinge, 21st December, 1846.

FISH CULTURE. See **PISCICULTURE**.

FISH-GLUE, a coarse species of isinglass (which see).

FISH-HAWK, a name given in America to the osprey or fishing-eagle (*Pandion haliaetus*). See **OSPREY**.

FISH-HOOK, a curved, barbed, and pointed steel wire used for catching fish. Redditch in Worcestershire and Limerick are the chief British seats of the fish-hook manufacture. The Limerick hook, which has the greatest reputation, has a barb that is forged solid, and then filed into the proper shape, while ordinary hooks have a barb that is raised by cutting into the wire. Hook-making machines are now common, especially in the United States, where the wire is run into the machine, and on the other side the hook drops out completed, with the exception that it must be tempered and coloured. See **ANGLING**.

FISHING. See **FISHERIES** and **ANGLING**.

FISH-LOUSE, a name for several crustaceans of the order Ichthyophthira, parasitic on fishes. Some are common on many of the British sea-fishes. *Argulus foliaceus* is found on fresh-water fishes, and even on tadpoles. Sickly fishes often become the victims of multitudes of these creatures, or the sickness is induced by the numbers which attack them. Many of the fish-lice exhibit a retrograde development from a free-swimming larval state to their parasitic reproductive stage. See **PARASITES**.

FISSION, in physiology. See **REPRODUCTION**.

FISTULA, in surgery, a channel, open at both ends, excavated between an internal part and the skin-surface, showing no tendency to heal, and generally arising from abscesses. It occurs most frequently at some outlet of the body, as the urinary passages and anus. All the forms of fistula can be successfully treated by modern surgical methods.

FITCHET, or **FITCH**. See **POLECAT**.

FITZGERALD, LORD EDWARD, was born near Dublin on Oct. 15, 1763, and died on June 4, 1798. He was a younger son of the Duke of Leinster, and about 1779, after having spent some years in France, he joined the Sussex militia. He subsequently served in various regiments, and would have perished at the battle of Eutaw Springs but for the assistance of a negro. On his return he was elected member for Athy in the Irish parliament, where he co-operated with Grattan and Curran. In 1792 he visited Paris, and whilst there married Pamela, the reputed daughter of the Duke of Orleans (Egalité) and Mme de Genlis. In 1796 he joined the United Irishmen, and plotted for a French invasion of Ireland; was betrayed by a spy, and arrested. He stabbed two of the officers sent to take him, but was disabled by a pistol-shot, which caused his death before he could be brought to trial.

FITZGERALD, EDWARD, poet and translator of Omar Khayyám, was born near Woodbridge, Suffolk, on March 31, 1809. At the age of twelve he was sent to King Edward the Sixth's School at Bury St.

Edmunds, and five years later he entered Trinity College, Cambridge, where he graduated in 1830. At school and college he formed several lifelong friendships with men who afterwards became celebrated in different spheres, amongst them being Spedding and Thackeray. At a later period he gained the friendship of Tennyson and Carlyle. His life was passed quietly—almost in retirement—in various parts of Suffolk, first at Bredfield, his birthplace, then near Ipswich, where he contracted friendships with George Crabbe, the son of his favourite English poet, and Bernard Barton, the Quaker poet; and lastly at Boulge Hall and Woodbridge. Books were his chief indoor recreation; out-of-doors he occupied himself at first chiefly with botany, and afterwards with his garden. His death took place suddenly on June 14, 1883. Fitzgerald's works are not numerous, by far the most important being his celebrated translation of the *Rubaiyât* (or quatrains) of the Persian semi-pessimistic astronomer-poet, Omar Khayyâm. Having for some time studied Persian, in 1856 he published a translation of Jâmi's *Salâmân and Absâl*. Three years later his *magnum opus* appeared without causing any stir, but before he died four editions had been issued. The beauty of Fitzgerald's poem is universally admitted, but some have doubted whether it does not contain more of the Englishman than of the Persian. The general consensus of opinion now seems to be that though undoubtedly embellished, altered in some ways and adapted, we have in Fitzgerald's work a real translation of Khayyâm's. Other works by him are *Euphranor*; a Dialogue on Youth (1851); *Polonius*; a Collection of Wise Saws and Modern Instances (1852), both of which appeared anonymously; *Six Dramas of Calderon*, freely translated by Edward Fitzgerald (1853); and translations of *Æschylus's Agamemnon* and the *Œdipus plays* of Sophocles. Tennyson's poem, *Tiresias*, was dedicated to Fitzgerald. See *Letters and Literary Remains of Edward Fitzgerald* by W. Aldis Wright (1893, 3 vols.; new edition, 1894, 2 vols.).

FITZGERALD, PEROY HETHERINGTON, a prolific novelist and miscellaneous writer, was born in Ireland in 1834. Educated at Stonyhurst College, Lancashire, and at Trinity College, Dublin, he was called to the Irish bar in 1855, and was afterwards a Crown Prosecutor on the North-eastern Circuit. Besides novels he has written many biographical and other works, of which the most important are: *Life of Laurence Sterne* (1864); *Charles Lamb: his Friends, his Haunts, and his Books* (1865); *Charles Townshend, Wit and Statesman* (1866); *Life of David Garrick* (1868); *Principles of Comedy and Dramatic Effect* (1870); *The Kembles: an Account of the Kemble Family* (1871); *Book of Theatrical Anecdotes* (1873); an edition of *Boswell's Johnson* (1874); *The Romance of the English Stage* (1874); *Life, Letters, and Writings of Charles Lamb* (1875-76); *History of the Suez Canal* (1876); *Croker's Boswell*, and *Boswell: Studies in the Life of Johnson* (1880); *A New History of the English Stage* (1882); *The Royal Dukes and Princesses of the Family of George III.* (1882); *Kings and Queens of an Hour: Records of Love, Romance, Oddity, and Adventure* (1883); *Life and Times of William IV.* (1884); *The Lives of the Sheridans* (1887); *Life and Times of John Wilkes, M.P.* (1888); *Picturesque London* (1890); and *Henry Irving: a Record of Twenty Years at the Lyceum* (1893). Mr. Fitzgerald's works, though very unequal in merit and often hastily written, always give evidence of great industry, and are generally amusing and instructive.

FIVE MEMBERS, *THE*, whom Charles I. attempted to arrest early in 1642, were John Pym,

John Hampden, Denzil Holles, Sir Arthur Haselrig, and William Strode, representing in the Commons Tavistock, Buckinghamshire, Dorchester, Leicester-shire, and Dorchester respectively. The king, expecting an impeachment of the queen, determined to prevent it by impeaching these commoners along with Lord Kimbolton. Acting on the advice of some of his friends he went down to the House on January 4, with armed men, to effect the arrest of the five members himself, but on finding that 'the birds were flown' he began to excuse himself, and explain that he had not intended to use force in any way. The impeachment was subsequently abandoned when the Commons had declared against the illegality of his procedure. This was one of the events immediately leading up to the Civil War.

FIVE-MILE ACT, an act of Charles II. (1665) forbidding Nonconformist clergymen who would not take the oath of non-resistance and swear to attempt no alteration of the constitution in church or state, to come within five miles of any corporate town where they had preached since the Act of Oblivion. They were also prevented from keeping schools. The act was repealed in 1688.

FIVES, a kind of game with a ball, originally called hand-tennis, played on a level piece of ground with a smooth wall, against which the ball is struck after its first rebound from the ground. It is so named probably because the ball is struck with the hand or *five* fingers. When a player of one side fails to make the ball hit the wall above a certain height the opposing side counts one point. Fifteen points constitute the game. There are two forms of the game played in English public schools, the one identified with Eton and the other with Rugby. Of these the former is the more elaborate. Fives gives excellent muscular exercise of a more moderate kind than that involved in our other athletic games.

FLAG, a popular name for many monocotyledonous plants with sword-shaped leaves, mostly growing in moist situations; but more especially applied to *Iris Pseudacorus*, belonging to the natural order Iridaceæ, and also termed *Flower de lis* or *Flower de luce*. See *IRIS*.

FLAMBARD, RANULPH or RALPH, a Norman of humble origin who became the chief minister of William Rufus. He was early connected with the Conqueror's court, and being handsome, clever, and unscrupulous, he gained great influence with the king, and rose to still greater favour with Rufus, whom he encouraged in his tyrannical and rapacious courses. His flagrant extortions earned the hatred of the people, and his character is painted in the blackest characters by the chroniclers. In 1099 he was made Bishop of Durham; but on the death of William he was committed to the Tower by Henry I. He managed to escape, however, by means of a rope conveyed to him in a vessel of wine, and instigated Robert, duke of Normandy, to invade England. He was subsequently forgiven by Henry and restored to Durham, where latterly he lived peaceably, much engaged in architectural works connected with the city and the cathedral, till his death in 1128.

FLAMMARION, CAMILLE, popular French writer on astronomy, was born at Montigny-le-Roi (Haute-Marne) on Feb. 26, 1842. In 1858 he entered the Paris observatory as pupil, being transferred in 1862 to the Bureau des Longitudes, where he remained till 1866. Although still a youth, he had already published the first of his many works, namely, *La Pluralité des Mondes habités* (1862; 36th ed., 1892); *Les Mondes imaginaires et les Mondes réels* (1865; 21st ed., 1892); and *Les Merveilles Célestes* (1866; 7th ed., 1881). In 1864 he became sci-

tific editor of *Cosmos* and the *Magasin Pittoresque*, and in the following year he was appointed to a similar post on the *Siècle*. At the same time he began his popular lectures, and was induced by their success to resign his official post. For five years from about 1868 he made a study of the upper regions of the atmosphere during several balloon ascents. In 1882 he founded the monthly magazine *L'Astronomie*, and in 1887 he started the French Astronomical Society. M. Flammarion has gained considerable fame for original researches in astronomy, especially in connection with double and multiple stars, colours of stars, sun-spots, and the proper motion of the stars; but he is much better known for his excellent, well-written and accurate popular hand-books. Of his works we may mention, in addition to those already noticed: *Études et Lectures sur l'Astronomie* (1867-80, 9 vols.); *Dieu dans la Nature* (1867; 22nd ed., 1892); *Lumen* (1872; 40th ed., 1890); *Uranie* (1889); *Voyages en Ballon* (1870; 20th ed., 1889); *Vie de Copernic* (1872); *L'Atmosphère* (1872); *Histoire du Ciel* (1873); *Petite Astronomie, descriptive* (1877); *Les Terres du Ciel* (1877); *François Arago* (1879); *Astronomie Populaire* (1880); *Les Étoiles et les Curiosités du Ciel* (1881); *Le Monde avant la Création de l'Homme* (1886); *Les Tremblements de Terre* (1886); *Qu'est-ce que le Ciel* (1891); and *La Planète Mars et ses Conditions d'Habitabilité* (1893). He translated into French Sir H. Davy's *Last Days of a Philosopher* (1869). Some of his works have been translated into English.

FLANNAN ISLANDS, or **SEVEN HUNTERS**, a group of small rocky islands in Scotland, in the Outer Hebrides, included in the county of Ross and Cromarty, about 15 miles W.N.W. of Gallon Head in Lewis. They are frequented by large numbers of sea-birds, and sheep used to be pastured on some of them. There is a lighthouse of recent erection, standing at a height of over 200 feet, the structure itself being 75 feet high, with a light visible 24 miles.

FLAVEL, JOHN, nonconformist divine, was born at Bromsgrove, Worcestershire, about 1627, and died at Exeter on June 26, 1691. After a distinguished career at University College, Oxford, he was curate at Deptford and Dartmouth, but was ejected under the Act of Uniformity, when he continued to preach privately. After the fall of the Stuarts he returned to Dartmouth. His works were long immensely popular, and included *Husbandry Spiritualized* (1669); *Navigation Spiritualized* (1671); *A Token for Mourners* (1674); *Divine Conduct* (1678); *England's Duty under the Present Gospel Liberty* (1689); and *Pneumatologia* (1698). Various collected editions of his works have appeared, and in 1828 a selection by Charles Bradley was published.

FLOGGING, the infliction of stripes or blows with a whip, lash, or scourge, especially as a judicial punishment. In Britain it long existed as a punishment in the army and navy; but it was totally abolished in the former in 1881, and in the latter it is practically extinct. It was made a punishment for certain violent crimes, such as garrotting, in 1863; and for juvenile offenders in 1847 and 1850. In these cases, however, the number of stripes is limited by law, fifty being the maximum in some instances, twenty-five in others, and so on. A judge in sentencing a prisoner to flogging must specify the instrument and the number of stripes. In the case of juveniles under fourteen years of age the instrument must be a birch rod, and the number of stripes must not exceed twelve. The punishment of the knout in Russia and of the bastinado in the East are severe forms of this punishment.

FLOOD, HENRY, Irish orator and politician, born near Kilkenny in 1782, and educated at Trinity College, Dublin, and Christ Church, Oxford. He entered the Irish parliament in 1788, and soon became the most prominent and eloquent member of the popular opposition. He killed an opponent in a duel in 1789 and was brought to trial, but a verdict of manslaughter in his own defence was returned. He was privy-councillor for Great Britain as well as for Ireland in 1775, and vice-treasurer for Ireland 1775-81. In 1788 he had a personal dispute in the house with Grattan, when a remarkable display of the power of invective was made on both sides. He afterwards became a member of the British parliament for Winchester and Seaford. He died on Dec. 2, 1791. His speeches and some poetical pieces have been published.

FLORIO, JOHN, lexicographer and translator, was born in London of Italian parents about 1553, and died in 1625. He taught French and Italian in Oxford University, matriculated at Magdalen College in 1581, was patronized by the Earls of Southampton and Rutland, and was appointed by James I. teacher of languages to the queen and Prince Henry. His chief works are his great Italian and English Dictionary, *A World of Words* (1598, improved edition 1611), and his translation of Montaigne (1603), of which the latter has long been justly celebrated. Shakspeare is said to have ridiculed him in the character of Holofernes in *Love's Labour's Lost*.

FLOTOW, FRIEDRICH FERDINAND ADOLF, FREIHERR VON, German musical composer, was born on his father's estate, Teutendorf, Mecklenburg-Schwerin, 27th April, 1812. He was destined for the diplomatic service, but as he early manifested great aptitude for music, his father took him to Paris, where he studied under the composer Reicha. His earlier operas (which include one called *Rob Roy*) did not find favour among the Parisian opera-house directors, so he had to content himself with performances in the private theatres of the aristocracy. This brought him gradually into notice, however, and his *Naufrage de la Méduse* was publicly produced in 1839. Alessandro Stradella was first performed at Hamburg in 1844, and his most successful opera, *Martha*, was originally given at Vienna in 1847. His subsequent works, such as *Indra* (1852), *Eübzahl* (1854), *Albin* (1856), *L'Ombre* (1869), achieved but small success. He died at Wiesbaden, 24th January, 1883. His widow has written an account of his life (1892).

FLOWER, SIR WILLIAM HENRY, zoologist and comparative anatomist, was born at Stratford-on-Avon on Nov. 30, 1831. After a medical training at University College, London, and Middlesex Hospital, he served as an assistant-surgeon in the army during the Crimean war, and from 1859 till 1861 he held a post in the Middlesex Hospital. In 1861 he was appointed conservator of the museum of the Royal College of Surgeons, and in 1870 Hunterian Professor of Comparative Anatomy and Physiology in the same institution. In 1884 he was appointed Director of the Natural History Departments of the British Museum, which two or three years before had been removed to their new quarters at South Kensington. From this post he retired in 1898. He died on July 1, 1899. He was President of the Zoological Society, and in 1889 he was President of the British Association meeting at Newcastle-on-Tyne. He was made a Knight Commander of the Bath in 1892. Several important treatises came from his pen, including *Introduction to the Osteology of the Mammalia* (1870, 3rd ed. 1885); *Fashion in Deformity* (1881); *Introduction to the Study of Mammals, Living and Extinct* (1891,

in conjunction with Mr. Lydekker); The Horse: a Study in Natural History (1892); and Essays on Museums and other Subjects connected with Natural History (1898). A number of articles in the ninth edition of the Encyclopedia Britannica are by him. He was a Fellow of the Royal Society, and held various academical distinctions.

FLOWERING-FERN, the popular name of *Osmunda regalis*, the Royal Fern, belonging to the order Osmundaceae. See OSMUNDA.

FLOWERING-RUSH (*Butomus umbellatus*), of the natural order Butomaceae, a beautiful plant found in pools and wet ditches of England and Ireland, but rare and not indigenous in Scotland. The leaves are 2 to 3 feet long, linear, triangular, their sharp edges sometimes cutting the mouths of cattle, whence their generic name *Butomus* (ox-cutting). The scape or flowering stem terminates in a large umbel of rose-coloured flowers. The root-stock was formerly used in medicine. This plant is often referred to the water-plantain order (Alismaceae).

FLUOHYDRIC ACID. Same as HYDROFLUORIC ACID.

FLUSTRA, a genus of Polyzoa, the sea-mats (which see).

FLYING DUTCHMAN, a phantom ship said to be seen in stormy weather off the Cape of Good Hope, and thought to forebode ill luck. One form of the legend has it that the ship is doomed never to enter a port on account of a horrible murder committed on board; another, that the captain, a Dutchman, swore a profane oath that he would weather the Cape though he should beat there till the last day. He was taken at his word, and there he still beats, but never succeeds in rounding the point. He sometimes hails vessels and requests them to take letters home from him. The legend is supposed to have originated in the sight of some ship reflected from the clouds. It has been made the groundwork of one or two novels (Marryat, Clark Russell), and of Wagner's opera *Der fliegende Holländer*.

FLYING-FOX. See FOX-BATS in SUPP., and KALONG BAT.

FLYING-PHALANGER, a popular name of the members of a genus of nocturnal marsupials (*Petaurus*) nearly allied to the true phalangers. A fold of the skin extends along the flanks, and this, acting as a parachute, enables the animal to leap great distances, its heavy tail serving as a rudder to guide its course in the air. These animals inhabit New Guinea and Australia, where they are known as 'flying-squirrels'. The species vary in size, the smallest being no bigger than a mouse. They feed on fruit, leaves, insects, &c.

FLYING-SQUID, the popular name of a genus of cephalopodous molluscs (*Omnastrephes*), allied to the calamaries or squids, having two large lateral fins, which enable them to leap so high out of the water that they sometimes fall on ships' decks. See SQUIDS.

FOCANI, a town in Roumania, 45 miles W.W.W. of Galatz, near the outlying hills of the Carpathian chain, with an important trade in grain. Pop. (1894), 12,904.

FOHR, a Prussian island in the North Sea, one of the North Frisian islands, off the west coast of Schleswig; area, 32 square miles; pop. about 4000, mostly Frisians engaged in fishing, the capture of wild fowl, and agriculture. The chief place on the island is Wyk.

FONTENAY-LE-COMTE, French town in the department of Vendée 27 miles N.E. of La Rochelle, on both banks of the Vendée, which is navigable

here. It has two fine Gothic churches and a communal college. Pop. (1896), 7293.

FOOLAH. See FELLATASE.

FOOL'S PARSLEY, the popular name of *Ethusa Cynapium*, one of the Umbelliferae, a common British weed, growing in cultivated grounds. It is commonly believed to be poisonous, and serious accidents are said to have occurred from its being mistaken for parsley; but if poisonous, it is so only in certain localities. The unilateral reflexed floral leaves of its involucre and the absence of a general involucre distinguish it from most plants to which it is allied.

FOO-SHAN, a town of China, in the province of Quangtung, 21 miles S.W. of Canton, on one of the branches of the delta of the Si-kiang. It has manufactures of silk, iron and steel, &c., and carries on some trade. Pop. 200,000.

FOOT-ROT, a disease in the feet of sheep, the more common form of which is an inordinate growth of hoof, which at the toe, or round the margin, becomes turned down, cracked, or torn, thus affording lodgment for sand and dirt. In the second form of the disease the foot becomes hot, tender, and swollen; there are ulcerations between the toes, followed by the sprouting of proud flesh.

FORBES, ARCHIBALD, journalist and war-correspondent, was born in Morayshire in 1838, being the son of a country minister. He received his education in the parish-school and at Aberdeen University. From 1859 till 1864 he served in the Royal Dragoons, but, abandoning the army for journalism, he joined the staff of the Daily News as war-correspondent. In this capacity he accompanied the German army through the war of 1870-71, and a little later, in Paris, he was present at the downfall of the Commune. He was in India during the 1874 famine, and shortly afterwards the Carlist and other troubles kept him for a time in Spain. He accompanied the Prince of Wales on his Indian tour of 1875-76, and on returning he described as an eye-witness the Serbian war of 1876. In the following year he was with the Russians in their campaign against the Turks, being present at the battle of Plevna, and in 1878 he went to Cyprus. He was under fire during the Afghan-istan campaign of 1878-79, next visited Mandalay, and then went to Zululand, where he accompanied Lord Chelmsford's army. He was present at the welcome victory of Ulundi, and was the first to telegraph home intelligence of the result. About this time his health began to be impaired by his arduous labours, and he afterwards devoted himself mainly to lecturing at home and in America and Australia. He died on March 30, 1900. His chief publications are: *My Experiences in the Franco-German War* (1872); *Glimpses through the Cannon Smoke* (1880); *Chinese Gordon* (1884); *Souvenirs of Some Continents* (1885); *William I. of Germany* (1888); *Barracks, Bivouacs, and Battles* (1891); *Havelock* (1891); *Afghan Wars* (1892); *Colin Campbell, Lord Clyde* (1895); *Camps, Quarters, and Casual Places* (1896); *Memories and Studies of War and Peace* (1896); *The Black Watch* (1896); and *Life of Napoleon III.* (1898).

FORBIDDEN FRUIT, a name fancifully given to the fruits of various trees grown in tropical countries, as the shaddock (*Citrus decumana*), a sort of thick-skinned orange (*Citrus paradisi*), and the poisonous fruit of the *Flacromontana diabolica*, an apocynaceous tree of Caylon, traditionally said to be the fruit of which Adam and Eve ate at the time of the fall in Eden.

FORCE-PUMP. See PUMP.

FOREIGN OFFICE, that department of the

British government presided over by the secretary of state for foreign affairs, and having its locale in Downing Street, Westminster. It was established in 1782, and has charge of British interests in foreign countries. The secretary for foreign affairs negotiates treaties, appoints diplomatic officers, &c. When the secretary of state is a member of the Upper House it is usual to appoint a commoner to the under-secretaryship. See SECRETARY OF STATE.

FOREST-OAK, the commercial term for the timber of trees of the genus *Casuarina*, belonging to Australia. It is called also She-oak, Swamp-oak, and Beef-wood. See CASUARINA in SUPP.

FORREST, EDWIN, American actor, born at Philadelphia, 9th March, 1806. He early manifested a passion for the stage, and in 1820 made his first appearance in public in the part of Douglas in Home's tragedy of that name. After performing for some years in various parts of the country he came before the New York public in 1826 in the character of Othello, and at once gained popularity. Similar triumphs followed in all the chief cities of the States, and in 1836 he crossed the Atlantic and entered on a season at Drury Lane Theatre, London. In the parts of Macbeth, Lear, and Othello he achieved distinguished success, and he acquired the friendship of Macready, Kemble, and others, and was entertained at a complimentary dinner in the Garrick Club. His engagement lasted for ten months, after which he returned to the United States. He again visited England in 1845, and on this occasion quarrelled bitterly and causelessly with Macready, whom he accused of trying to damage his reputation from professional jealousy. This quarrel crossed the Atlantic, and when Macready was playing in the Astor Place Theatre, New York, in 1849, the partisans of either actor stirred up a riot that was accompanied by serious loss of life. Soon after this, divorce proceedings were instituted by Mrs. Forrest against her husband (they had been married in 1837), which in 1852 terminated in a verdict in her favour and in the loss of much of the respect in which Mr. Forrest had previously been held. Between 1853 and 1860 he retired from professional life, but when he returned to the New York stage he filled the rôle of Hamlet with all his former acceptance. Latterly he suffered considerably from illness, and his last engagement was in 1871. He died of paralysis, Dec. 12, 1872. He was a man of fine presence, well equipped for his profession, naturally frank and engaging. He left a large fortune.

FORREST, SIR JOHN, Australian explorer and politician, was born in Western Australia on Aug. 22, 1847. He entered the Survey Department of Western Australia in 1865, and in 1869 he commanded an expedition into the interior in search of Dr. Leichhardt and his party, but in this quest he was no more successful than others. In the following year he led an expedition from Perth to Adelaide along the southern coast, and in 1874 he was at the head of a party which explored a part of the interior, proceeding from Champion Bay on the west to the overland telegraph line connecting Adelaide on the south with Port Darwin on the north coast. For these services he was thanked by the Governor and Council, and received a grant of 5000 acres of land; while the Royal Geographical Society awarded him a gold medal as an explorer. He was appointed Deputy Surveyor-General of Western Australia in 1876, Acting Commissioner of Crown Lands in 1878, Commissioner of Convicts and of Imperial Expenditure 1880-81, and Commissioner of Crown Lands and Surveyor-General in 1883. In 1890 he was returned unopposed to the first Western Australia Legislative Assembly for Bun-

bury, and became the first premier and treasurer of the colony. In 1901 he was appointed minister of defence in the first Commonwealth cabinet. He was made a K.C.M.G. in 1891, having been already created C.M.G. in 1882. In 1897 he was sworn of the privy council. His publications are *Explorations in Australia* (1876), and *Notes on Western Australia* (1884-87).

FORSTER, JOHN, an English writer especially distinguished for biography. He was born at Newcastle on April 2, 1812. He was educated for the bar, but early adopted literature as a profession, and displayed his aptitude for biography, while he was still compelled to do hack-work for a living, in his *Statesmen of the Commonwealth* (1836-39), contributed to the series of works comprising Lardner's *Cyclopædia*. For more than eighteen years he was a leading contributor to the *Examiner*, of which during nine of these years he was the editor. He also contributed to other periodicals, and he succeeded Dickens as editor of the *Daily News*, but he resigned this post in less than a year. In 1855 he was appointed secretary to the lunacy commission, and in 1861 a commissioner in lunacy. His life of Oliver Goldsmith appeared in 1848; *Biographical and Historical Essays* (1858); *Arrest of the Five Members* by Charles I., and *Debates on the Grand Remonstrance* (1860); Sir John Eliot, a biography, 1590-1632 (1864); Walter Savage Landor, a biography 1775-1864 (two vols. 1869); *Life of Charles Dickens* (three vols. 1872-74). At the time of his death he was engaged on a life of Swift, the first volume of which was published a few weeks before his death. In early life Forster formed an attachment to Letitia Elizabeth Landon, the poetess, but they parted on some quarrel. He afterwards married the widow of Colburn the publisher. He died 2nd February, 1876. Forster was fitted for the work of a biographer as well by the patient labour which he bestowed on the investigation of all details necessary to his work, as by the sympathetic character of his mind, which enabled him to read the facts in their true light and significance.

FORSYTH, WILLIAM, English lawyer and writer, born at Greenock on Oct. 25, 1812. After a brilliant career at Trinity College, Cambridge (of which he became a fellow), he studied law, was called to the bar in 1839, and became a queen's counsel in 1857. He represented the borough of Marplebone in the House of Commons in 1874-80. Besides legal works he wrote: *Hortensius*, or the Duty and Office of an Advocate (1849); *The History of Trial by Jury* (1852); *Napoleon at St. Helena* and *Sir Hudson Lowe* (1853); *Life of Cicero* (1864); *Novels and Novelists of the Eighteenth Century* (1871); *Hannibal in Italy*, a drama (1872); &c. He died on Dec. 26, 1899.

FORTUNY, MARIANO, a Spanish painter, born near Barcelona, 11th June, 1839. He studied at Madrid, travelled in Morocco, and settled at Rome, where he became the centre of a school of artists in revolt against over-study of the 'masters'. In 1866 he went to Paris, where his pictures, mostly genre subjects from southern and oriental life, had a great success. Amongst the best known are: *A Spanish Marriage*, *A Fantasia at Morocco*, *The Academicians at Arcadia*, *The Seashore at Portici*. He was also known as an able etcher. He died at Rome on Nov. 21, 1874. There are lives by Davillier (1878) and Yriarte (1886).

FOSTER, MYLES BIRNEY, an English artist, was born at North Shields on Feb. 4, 1825. He began to draw when quite a child, and at the age of sixteen was apprenticed to E. Landells as a pupil in the art of wood-engraving. Becoming himself a clever

draughtsman and painter in water-colours, he soon achieved a high reputation as book-illustrator, and illustrated the works of Goldsmith, Scott, Longfellow, Rogers, Beattie, &c. His landscape drawings on wood are of great excellence. From about 1838 onwards he mainly devoted himself to water-colour painting, in which his reproductions of rustic life were very successful. In 1862 he became a member of the Water-Colour Society, to the exhibitions of which he contributed some 350 drawings. He also had about twenty paintings in oil hung at the Royal Academy Exhibitions, and was not without success as an etcher. He published *Brittany*, a series of thirty-five sketches (1878), and other works. He died at Weybridge on March 23, 1899.

FOULA, a solitary island, the most westerly of the Shetland group, lying 16 miles s.w. of the nearest point of Mainland and 35 miles n. of Orkney. It is a little over 3 miles in length and is 2½ miles in breadth. The Old Red Sandstone cliffs, in some parts, rise to the height of 1220 feet, and swarm with sea-fowl, among which is the great skua. Pop. (1891), 239.

FOWEY, a seaport of England in Cornwall, on the right bank of the estuary of the Fowey, near its mouth, 5 miles south of Lostwithiel, formerly one of the chief seaports of England, and long a parl. and municipal borough. It carries on an extensive pilchard fishery. Pop. (1891), 1957.

FOWLER, SIR JOHN, civil engineer, was born near Sheffield in 1817. On the conclusion of his school education he began the study and practice of engineering, and after being initiated into the profession he gained further experience as an assistant-engineer in the construction of the London and Brighton and other lines of railway. For a short period he was resident engineer on the Stockton and Hartlepool and other adjacent railways, and in 1844 he was appointed to superintend the construction of the Manchester, Sheffield, and Lincolnshire system, a connected group of railways, and other works of vast extent and complexity. He subsequently was employed on many civil engineering works both in England and elsewhere; but the work with which his name will probably be most lastingly connected is the great bridge across the Forth, of which he was chief engineer, having as his colleague Mr. (now Sir) Benjamin Baker (see FORTH BRIDGE). On its completion in 1890 he was made a baronet, having already (in 1885) been created K.C.M.G. for services in Egypt during the immediately preceding years. He died on Nov. 20, 1898.

FOWLER, REV. THOMAS, writer on philosophy, was born at Burton-Stather, Lincolnshire, on Sept. 1, 1832. He received his earlier education at King William's College, Isle of Man, subsequently proceeding to Merton College, Oxford, where he graduated with first-class honours in classics and in mathematics in 1854. In the following year he became a Fellow and Tutor of Lincoln College, and from 1873 to 1889 he was Professor of Logic in the university. Since 1881 he has been President of Corpus Christi College. He is a D.D. of Oxford and LL.D. of Edinburgh University. In 1899 he was appointed vice-chancellor of the university. His published works include: *Elements of Deductive Logic* (1867; 10th ed., 1892); *Elements of Inductive Logic* (1870; 6th ed., 1892); an edition of Bacon's *Novum Organum*, with introduction and notes (1878; 2nd ed., 1889); a little work on Locke (1880, in the *English Men of Letters* series); an edition of Locke's *Essay on the Conduct of the Understanding* (1881; 3rd ed., 1890); Francis Bacon (1881); Shaftesbury and Hutcheson (1882, both

these in the *English Philosophers* series); *Progressive Morality: an Essay in Ethics* (1884; 2nd ed., 1895); *History of Corpus Christi College, Oxford* (1898); *Principles of Morals* (Part I, introduction written in conjunction with J. M. Wilson, 1885; Part II, the body of the work, by Professor Fowler alone, 1887; both in one volume, revised, 1894); and *Popular History of Corpus Christi College* (1898, in series of College Histories). Dr. Fowler has also contributed to many periodicals and to the *Encyclopædia Britannica*.

FOX-BATS, or *Flying-foxes*, a name given to the fruit-eating bats of the family Pteropidae, including some of the largest of the bat tribe, one species, the *Pteropus edulis* or kalong, attaining a length of from 4 to 5 feet from the tip of one wing to the tip of the other. They inhabit Australia, Java, Sumatra, Borneo, &c., as well as the continents of Asia and Africa. See KALONG BAT.

FOXHOUND. See HOUND.

FOX-HUNTING, a favourite English sport much practised during the autumnal and winter months. A pack of foxhounds consists of from 20 to 60 couples of hounds according to the frequency of the hunting days. These dogs are carefully bred and trained, and are under the superintendence of one experienced gentleman called the *master*, who has the general control of the whole 'field'. Under him are the *huntmen*, whose duty it is to look after the hounds in their kennels and direct them in the field. He is directly responsible for their condition and training. Next him are the *whippers-in*, whose main duty is that of assisting generally the huntman both in the kennels and in the field. A less important function of the whipper-in is that of urging on lagging hounds. The night before a hunt, the gamekeeper, calculating on the habits of the fox to leave his burrow or 'earth' in search of food at night, stops all the 'earths' after the foxes have left them. The animals are thus forced to seek refuge in neighbouring thickets or other cover, generally near their 'earth', and this fact determines the arrangements of the day's hunting. The huntmen assemble in the neighbourhood of the stopped 'earth' and draw the neighbouring coverts by throwing off the dogs to search for the fox. The presence of the fox is generally indicated by the whine of some old and experienced hound who has first scented him; but he may hang or keep within the covert for a long time. The person who first sees the fox leave the covert, *break cover* as it is called, gives the *view-halloo* after it has got some little distance, upon which the huntman collects his hounds and sets off in chase followed by the entire field. The foxhounds follow almost entirely by scent, the fox being itself perhaps far ahead and out of sight. Wherever, therefore, the scent fails the hounds are *at fault*, and there is a *check* till the scent is recovered. When the scent is good, most of the hounds own it by giving tongue, and they are then said to be in *full cry*. The rider who is first in at the death lashes the hounds off and secures the head, feet or *paws*, and tail or *brush* of the fox. The midland counties of England, Leicester, Warwick, Yorkshire, &c., are the most celebrated for fox-hunting. Fox-hunting did not assume anything like its present form till the latter part of the eighteenth century, but there are several earlier notices of the sport. There are now more than 350 packs in the United Kingdom, some of them being of considerable antiquity.

FRA BARTOLOMEO. See BACCIO DELLA PORTA.